Grand Canyon

National Park Service
U.S. Department of the Interior

Grand Canyon National Park

Environmental Assessment/Assessment of Effect

March 2003

Replacement, Rehabilitation and Maintenance of Backcountry and Corridor Toilets

Grand Canyon National Park • Arizona

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Summary

Grand Canyon National Park proposes to replace and/or rehabilitate and maintain eleven toilets in the backcountry and seven toilets in the Cross-Canyon corridor in the inner canyon of Grand Canyon National Park. There is an immediate need to address the condition of backcountry toilets in the Park and the Park's toilet maintenance program. The proposal is needed to address the following management concerns: Many of the existing backcountry toilets are substandard and pose safety and health risks for Park personnel and visitors and many of these toilets are difficult to maintain and are not conducive to regular routine maintenance. An evaluation of the backcountry and corridor toilet maintenance program in one document provides an opportunity to adequately analyze impacts of the program. This includes a "Minimum Requirement Analysis" for potential impacts to proposed wilderness.

This Environmental Assessment evaluates three alternatives for addressing the purpose and need for action, including a no action alternative and two action alternatives. Both action alternatives include: 1) replacement of existing pit toilets at six backcountry sites with aboveground vault toilets, 2) transportation of these vault units into the backcountry via helicopter and 3) improved cyclic maintenance of all backcountry and corridor toilets throughout the year. The preferred alternative, Alternative B, also includes helicopter use for periodic emptying/removal at 11 sites and mule and/or boat use for six sites. Alternative C proposes helicopter use for periodic emptying at three sites and a combination of mules, boats or backpack transport for periodic emptying at the remainder of the sites.

Neither action alternative would have measurable impacts to air quality, soils, water, vegetation, floodplains, wetlands, general wildlife populations, wildlife species of interest, environmental justice, prime and unique farmland, or the socioeconomic environment. Neither action alternative would result in alteration of areas proposed for wilderness designation or wilderness boundaries. Long-term impacts to visitor experience from either action alternative would be moderate in intensity and beneficial while short-term impacts would be moderate and adverse. Impacts to park operations from either action alternative would also be long-term, beneficial and moderate in intensity due to pit toilet replacement, but adverse impacts that were long-term and moderate in intensity are also expected from implementation of Alternative C. Impacts to special status species would range from negligible to moderate and would be adverse. Impacts to soundscape would be minor to moderate in intensity and generally short-term for the preferred alternative and minor in intensity and short-term for Alternative C. Both minor beneficial long-term impacts and minor adverse long-term impacts to cultural resources would occur from implementation of either action alternative.

Public Comment

This environmental assessment will be on public review for 30 days. If you wish to comment on the environmental assessment, you may mail comments to the name and address below, no later than **April 25, 2003**. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Please Address Comments to:
Joseph F. Alston, Superintendent
Attention: Sara White, Compliance Officer
Grand Canyon National Park
P.O. Box 129
1 Village Loop
Grand Canyon, Arizona 86023

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Chapter 1 – Project Scope

INTRODUCTION

The purpose of this document is to disclose the expected effects to the human environment of various components of the proposed replacement/rehabilitation and maintenance project. The human environment is defined as the natural and physical environment and the relationship of people with that environment. The backcountry and corridor toilets are on lands administered by Grand Canyon National Park, in Coconino and Mohave Counties, Arizona. The proposal for backcountry toilets includes removal of existing pit toilets, replacement of existing toilets with aboveground vault toilets and maintenance of the toilets. The proposal for corridor toilets includes maintenance methods. Ground disturbing activities would be limited and primarily restricted to areas already disturbed. For further reference, see the project vicinity map (Figure 1) and Management Zone map (Figure 2). Appendix A1 – A3 shows toilet locations in relation to each other and Appendix F includes topographic maps showing each backcountry and corridor toilet location.

PURPOSE AND NEED FOR ACTION

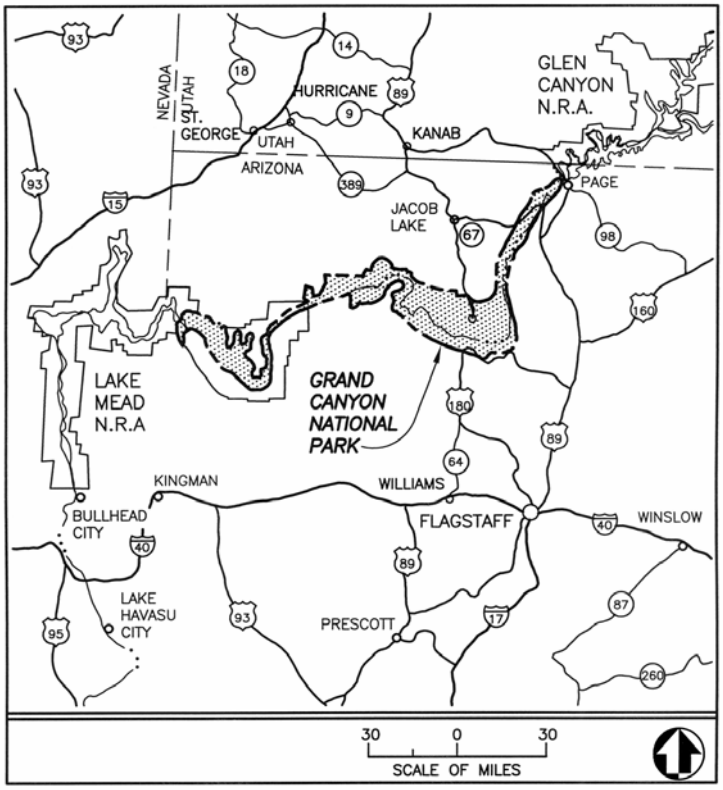
This project would replace and/or rehabilitate and maintain eleven toilets in the backcountry and seven toilets in the Cross-Canyon corridor in the inner canyon of Grand Canyon National Park. These sites include:

Backcountry Toilets	Corridor Toilets
Horseshoe Mesa (2)	1 and ½ Mile (Bright Angel Trail)
Monument Creek	Indian Garden (Bright Angel Trail)
Upper Tapeats	Cedar Ridge (South Kaibab Trail)
Tanner	Tipoff (South Kaibab Trail)
Deer Creek	Cottonwood (North Kaibab Trail)
Clear Creek	Roaring Springs (North Kaibab Trail)
Salt Creek	Supai Tunnel (North Kaibab Trail)
Horn Creek	
Hermit Creek	
Waldron (Hermit) Basin	

These restrooms are a sub-set of a larger Park-wide restroom rehabilitation/replacement project. The primary purpose of the Park-wide project is to address the fact that most restrooms in the Park are old, over-crowded, and/or not up to current standards. Many facilities are no longer meeting the needs of the visitors, due to dramatic increases in visitation rates to the Park since 1984. A major complaint received from visitors is the inadequacy of the restroom facilities.

Many of the existing backcountry toilets are pit toilets that are substandard, and expose Park employees to unsanitary conditions while cleaning and servicing these toilets. An improvement in the safety and health of employees maintaining these toilets, as well as the visitors who use them,

Figure 1. Project Vicinity



is needed. There is an immediate need to replace, rehabilitate and maintain these toilets as soon as possible due to the current substandard conditions at many of the backcountry sites. If action is not taken at this time, conditions at many of the toilet locations would deteriorate and some sites would likely need to be closed indefinitely.

These actions are consistent with the 1995 Grand Canyon National Park General Management Plan (GMP), NPS Management Policies (2001), NPS Director's Orders, and other applicable laws and regulations.

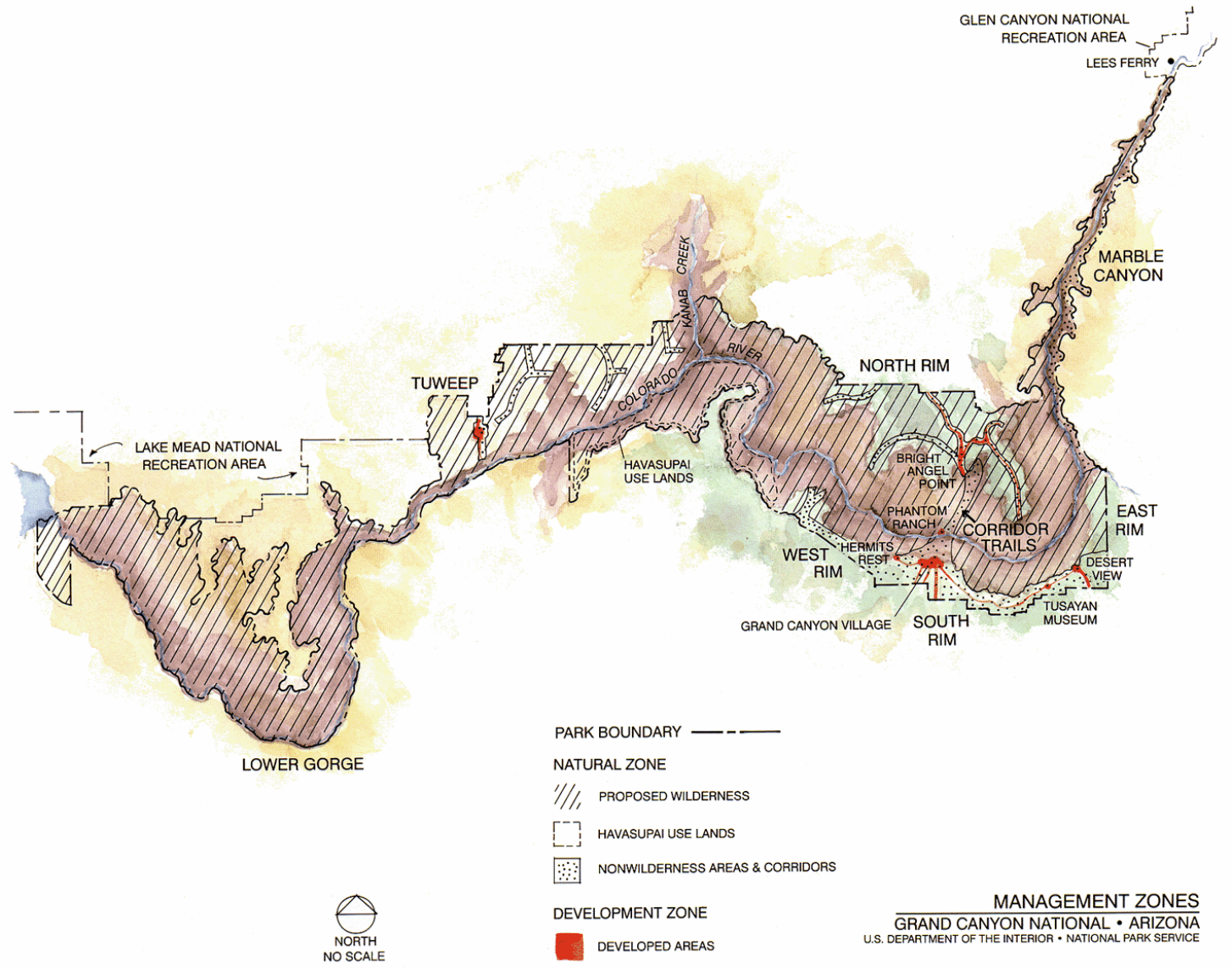
The GRCA 1995 General Management Plan (GMP) does not specifically discuss backcountry toilets. It does however, discuss Corridor Trails and toilets:

> Page 56: Existing Toilets along the trails will be replaced with water-conserving models, and more toilets will be added, if needed.

The current Backcountry Management Plan allows toilets in Threshold and some Primitive Management Zones as a means of dealing with localized problems. Because many of the backcountry toilets are substandard, reduction in the safety and health risks to employees maintaining these toilets, and the visitors who use them, is needed.

This proposal is intended to improve the overall experience of backcountry and corridor users. Direction in the GMP focuses on continued use of existing facilities and high-quality visitor services. The proposal is needed to address the following management concerns:

- Many of the existing backcountry toilets are substandard and pose safety and health risks for Park personnel responsible for servicing them, and visitors who use them.


GLEN CANYON NATIONAL RECREATION AREA
LEES FERRY
MARBLE CANYON
KANAB CREEK
COLORADO RIVER
TUWEEP
NORTH RIM
LAKE MEAD NATIONAL RECREATION AREA
HAVASUPAI USE LANDS
BRIGHT ANGEL POINT
PHANTOM RANCH
CORRIDOR TRAILS
EAST RIM
WEST RIM
HERMITS REST
DESERT VIEW
TUSAYAN MUSEUM
GRAND CANYON VILLAGE
SOUTH RIM
LOWER GORGE
PARK BOUNDARY
NATURAL ZONE
PROPOSED WILDERNESS
HAVASUPAI USE LANDS
NONWILDERNESS AREAS & CORRIDORS
DEVELOPMENT ZONE
DEVELOPED AREAS
NORTH
NO SCALE
MANAGEMENT ZONES
GRAND CANYON NATIONAL • ARIZONA
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- Many of the existing backcountry toilets are difficult to maintain and are not conducive to routine regular maintenance.
- Evaluation of the complete backcountry and corridor toilet maintenance program in one document provides an opportunity to adequately analyze impacts of the program. This includes a "Minimum Requirement Analysis" for potential impacts to proposed wilderness.

Objectives of the Action

1) To provide serviceable toilets in the backcountry and along the Cross-Canyon corridor
2) To minimize ground disturbance and vegetation disturbance at each site
3) To minimize the visual impact of new toilets and maximize compatibility with wilderness direction and management.
4) To maximize the length of time necessary between maintenance servicing trips for all backcountry and corridor toilets.

MANAGEMENT AND PLANNING HISTORY

National Park Service Management Policies (2001) is the guiding document for management of all national Parks within the national Park system. It is the basic Service-wide policy document of the National Park Service that supercedes the 1988 edition. It is the highest of three levels of guidance documents in the NPS Directives System. As stated in the introduction, "It (NPS Directives System) is designed to provide NPS management and staff with clear and continuously updated information on NPS policy and required and/or recommended actions, as well as any other information that will help them manage Parks and programs effectively." Among direction on all aspects of Park management, these Management Policies set forth direction for each unit of the national Park system to maintain an up-to-date General Management Plan. Chapter 6– Wilderness is also very applicable to this project.

Grand Canyon National Park is currently operating under the direction of the *1995 General Management Plan* (GMP). This plan provides guidance for resource management, visitor use, and general development for a period of 10 to 15 years. The primary purpose of the Plan is to provide a foundation from which to protect Park resources while providing for meaningful visitor experiences. A summary of the GMP, as it applies to this project, is provided in Appendix B.

Grand Canyon National Park is managing proposed wilderness areas in the Park under the direction of NPS Management Policy, Director's Order and Reference Manual #41, Wilderness Preservation and Management and specific guidance including Grand Canyon National Park's 1995 General Management Plan and the 1988 Backcountry Management Plan. An effort was undertaken in 1995-1998 to revise the backcountry management plan, including the drafting of an environmental assessment, resulting in the 1998 Draft Wilderness Management Plan. This 1998 draft has not been finalized. The 1998 draft addresses the issue of toilets in proposed wilderness and has designated various management zones guiding management in the backcountry. The management zones and the presence of toilets at each of these sites are consistent with direction outlined in the 1988 plan. An amendment was made to the 1988 Plan identifying backcountry use area boundary changes, based on the completion of a Categorical Exclusion in May 1999. The current 1988 Plan includes the changes made to use area boundaries and constitutes the complete 1988 Plan. When an alternative is selected for implementation of this replacement/rehabilitation and maintenance of backcountry toilets project, based on the analysis summarized in this document, this will also be considered an amendment to the 1988 Backcountry Management Plan.

The Park has recently been directed by the Unites States District Court (Grand Canyon Private Boater's Ass'n v. Alston, Case No. CV-00-1277-PCT-PGR-TSZ, 2/5/02) to issue a Notice of Intent to revise the Park's Backcountry Management Plan by the end of 2005. Management direction for Grand Canyon's backcountry could change as a result of this new Backcountry Management Plan.

Most of the Grand Canyon backcountry (not including the Cross-Canyon Corridor) lies within proposed wilderness. NPS policies require that these proposed areas be managed under the provisions of the Wilderness Act. As such, the maintenance of backcountry toilets falls under the "minimum tool concept," which allows for Park superintendents to select the method or administrative practice necessary to successfully and safely accomplish the management objectives with the least impact on wilderness character and resources. A "Minimum Requirement Analysis" will be conducted to determine the minimum tools or methods necessary for both the installation and long-term maintenance of these toilets in proposed wilderness. Options that will be evaluated during this process include the use of helicopters, mules, backpacks, and boats, or a combination of these methods, depending on the site.

Grand Canyon National Park is managing the Cross-Canyon Corridor under the direction of NPS Management Policy and specific guidance including Grand Canyon National Park's 1995 General Management Plan and the 1988 Backcountry Management Plan. The 1988 Plan guides management of the Cross-Canyon Corridor as part of the Corridor Management Zone.

An interdisciplinary team discussed potential issues with the project during a meeting on March 15, 2001. On August 20, 2001 an interdisciplinary team met to confirm the purpose and need for action, the proposed action and issues with the proposal. On October 15, 2001 an interdisciplinary team met to conduct a Minimum Requirement analysis that included an evaluation of several options for installation, replacement, and maintenance of the toilets. The Park Service met on December 13, 2000 with U.S. Fish and Wildlife Service and Arizona Game and Fish Department personnel to discuss this project proposal and other future proposals. Additional discussions with the interdisciplinary team regarding this project took place on July 9 and August 20, 2002. Internal review drafts of this document were reviewed by the interdisciplinary team and other NPS staff from October 2002 – January 2003.

This project was the subject of a public scoping letter that was submitted to a 300-person Grand Canyon National Park mailing list and a 150-person backcountry users mailing list on October 24, 2001. This scoping letter was also posted on the Grand Canyon National Park website and the Grand Canyon Hikers internet newsgroup on October 25, 2001. The purpose of the scoping letter was to describe the proposed action to any interested/affected parties and solicit comments from those who may have issues with the proposed action. As a result, 19 responses were received from individuals and six responses were received from agencies or groups. The agencies/groups included the Arizona Wilderness Coalition, U.S. Fish and Wildlife Service, Arizona Department of Environmental Quality, Zuni Heritage and Historic Preservation Office, the Navajo Nation Historic Preservation Department and the Hopi Tribe Cultural Preservation The responses from the Zuni Tribe, Navajo Nation and the Hopi Tribe offered no specific comment on the proposal and thanked the Park for keeping them informed. The U. S. Fish and Wildlife Service provided a list of federally listed species in Coconino County. The Arizona Department of Environmental Quality indicated that no Section 404 permit is required for this project. The Arizona Wilderness Coalition brought up concerns regarding the relationship of this project with the existing 1988 Backcountry Management Plan and the 1998 Draft Wilderness Management Plan, issues regarding Minimum Requirement Analysis and specific comments on three of the current toilet sites. Of the nineteen responses from individuals, fifteen of them were positive and indicated

support of the project, one was negative and indicated a preference for composting toilets over vault toilets in the backcountry and three responses were neutral. The Park Service performed a content analysis on this information, information gained from internal scoping, and information gained from scoping with other agencies. From this effort, the Park Service did not identify any additional significant issues for analysis.

Pack-Out Options: Grand Canyon National Park has recently begun a review of methods other than toilets to deal with human waste in the backcountry. The Park has recently been contacted by private vendors that produce products such as small plastic human waste pack-out "kits" intended to be given to backcountry users at the beginning of their trip and then packed out. Some National Parks and National Forests have begun programs such as this as part of their "leave no trace" programs and have had preliminary success. Grand Canyon National Park is in the early stages of determining the feasibility and applicability of a similar program in the backcountry. The upcoming revision of the Park's Backcountry Management Plan, intended to begin at the end of 2005, would provide a logical forum for a detailed evaluation of such a program.

This EA incorporates by reference and tiers to the General Management Plan Environmental Impact Statement (July 1995) and the 1988 Backcountry Management Plan, as amended. As stated previously, this EA and subsequent decision documents will constitute an additional amendment to the existing 1988 Backcountry Management Plan that addresses backcountry toilets.

ISSUES AND IMPACT TOPICS

Various agencies have been contacted and consulted as part of this environmental analysis. Appropriate federal, state, and local agencies have been contacted for input and review (see Chapter 5 for a list of persons contacted). National Park Service specialists, with input from federal, state, and local agencies identified issues and concerns (i.e. impact topics) affecting this project. After public scoping, issues and concerns were distilled into distinct impact topics to facilitate the analysis of environmental consequences, which allows for a standardized comparison between alternatives based on the most relevant information.

An issue is an effect on a physical, biological, social, or economic resource. The predicted effects of an activity create the issue. Issues may come from the public, from within an agency or department, or from another agency (Freeman and Jenson 1998). For this project, issues with various proposed alternatives were identified by the interdisciplinary team and were brought forward by other agencies. No additional issues came forward through public scoping. Once issues were identified, they were used to help formulate alternatives and mitigation measures. Impact topics were then selected for detailed analysis based on substantive issues, environmental statutes, regulations, executive orders, and *NPS Management Policies* (2001). A summary of some of these compliance-related laws and regulations is provided in Appendix C. A summary of the impact topics and rationale for selection/dismissal are given below.

Impact Topics Dismissed from Further Analysis

Air Quality - Clean, clear air is essential to preserve the resources in Grand Canyon National Park, as well as for visitors to appreciate those resources. Grand Canyon National Park is a federally mandated Class I area under the Clean Air Act. As such, air in the Park receives the most stringent protection against increases in air pollution and in further degradation of air quality related values. The Act then sets a further goal of natural visibility conditions, free of

human-caused haze. Air quality in the Park is generally quite good. Pollution levels monitored in the Park fall below the levels established by the Environmental Protection Agency to protect human health and welfare. However, the ability to see through the air (visibility) is usually well below natural levels because of air pollution. Most of this pollution originates far outside the Park's boundaries, and arrives in the Park as a well-mixed regional haze, rather than as distinct plumes.

Section 118 of the Clean Air Act requires all federal facilities to comply with existing federal, state, and local air pollution control laws and regulations. The scope of this project will not require consultation with the State of Arizona regarding air quality. Because there is ground disturbance involved, albeit minor, there is a possibility of raising nuisance dust during installation activities or from disturbed areas afterwards. There is also the potential for raising dust if helicopters are used for installation and maintenance by raising dust from rotor wash near disturbed ground. Measures can be taken to minimize the likelihood of substantial nuisance dust during helicopter use by minimizing the ground disturbance at the site and maximizing the amount of revegetation in areas of bare ground. Mitigation measures have been developed to address this concern and are listed in Chapter 2.

Because new ground disturbance for this project will be minimal and any nuisance dust generated can be minimized through implementation of mitigation measures, indirect air quality impacts from implementation of this project are considered short-term and localized. Therefore, local air quality may be temporarily degraded by dust generated from helicopters, but this degradation would result in an overall negligible impact to air quality, and would last only as long as helicopter use occurred. Impacts to overall Park air quality or regional air quality are not expected. For these reasons, air quality was dismissed from further analysis.

Soils and Water – There is currently an existing toilet at all sites proposed for replacement/rehabilitation, with the exception of the Waldron Basin toilet. Each site (except Waldron Basin) is already in a disturbed area and installation of a replacement toilet and/or the installation of screening would not result in any substantial ground disturbance. Each toilet unit is quite small (generally less than a 10 foot by 10 foot area) and would not require any substantial changes to the surrounding area to install. Cyclic and long-term maintenance would not result in any changes to soils or water resources in the surrounding areas.

The aboveground vault toilets proposed for each site sit on top of the ground, requiring very little soil disturbance on site. The aboveground vault units are self-enclosed portable structures that are exempt from the requirement to obtain an Aquifer Protection Permit from the Arizona Department of Environmental Quality (ADEQ 2001). They would be designed, constructed and operated so as not to discharge per A.R.S 49-250(B)(22) and therefore, do not pose a risk to water quality. Therefore, because impacts to soils and water resources as a result of implementing this project are considered negligible in both the short and long term, this topic was dismissed from further analysis.

Vegetation - Proposed installation and maintenance of these toilets would not result in any substantial disturbance of existing vegetation communities in the surrounding areas. The replacement toilets would be installed in areas that already have a toilet of some kind and are in areas already disturbed from this type of use, with the exception of Waldron Basin. The aboveground vault toilet units are quite small, sit directly on top of the ground, and would require very little changes on site for installation. There may be a need in some specific situations to disturb vegetation on site, but this would be limited to some minor pruning of surrounding trees or shrubs and would be done in compliance with the Park's pruning

guidelines. A clear trail to each toilet would be maintained through pruning, as necessary. The site selected for the Waldron Basin toilet would be conducive to installing an aboveground toilet without having to disturb vegetation to install it. Natural vegetation screening would be used at this site so that privacy screening would not be needed. Some of the toilet sites may have social trailing and/or bare ground that would benefit from revegetation efforts. This type of work would be conducted as necessary and would be conducted in compliance with the mitigation measures developed for salvage and revegetation efforts, as described in Chapter 2. Therefore, because installation and maintenance of the proposed toilets would result in only negligible short-term impacts to vegetation and implementation of mitigation measures would minimize the likelihood of impacts to native vegetation, this topic was dismissed from further analysis.

Floodplains and Wetlands - Executive Order 11988 (Floodplains) and Executive Order 11990 (Wetlands), which require federal agencies to examine the potential impacts of actions on floodplains and wetlands, were reviewed for applicability to this project. Some toilet sites occur near drainages and are in a floodplain. However, because the toilet units are small aboveground vaults that are self-contained, are designed and maintained not to discharge, and are portable, the toilets are exempt from the requirement to obtain an Aquifer Protection Permit per A.R.S 49-250(B)(22). The units are small and would require only minimal on-site disturbance to soils or vegetation. Riparian vegetation that may surround those sites near drainages would not be substantially disturbed by the installation or maintenance of a vault toilet. Therefore, because impacts to floodplains and wetlands are not expected, this topic was dismissed from further analysis.

General Wildlife Populations/Species of Interest: The inner canyon is extremely diverse in terms of topography and vegetation and provides habitat for a wide variety of wildlife species. Riparian habitat along the Colorado River and its tributaries provides seasonal and year-round habitat for numerous breeding birds, reptiles, amphibians, small mammals and aquatic species. Desertscrub habitat provides habitat for mammal species such as coyotes, kangaroo rats, jackrabbits, and pocket mice. Birds may include black-chinned sparrows, cactus wrens, phainopeplas, and white-winged doves. Reptiles such as chuckwallas, black collared lizards, Grand Canyon rattlesnakes, and western whiptails are also characteristic of this habitat type in the inner canyon. Pinyon-juniper woodlands occur below the canyon rims and provide habitat for such species as mule deer, pinyon jays, gray vireos and plateau striped whiptails (Brown 1994, Stevens 1983).

Representatives from the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and Grand Canyon National Park met in December 2000 to discuss many upcoming projects within the Park, and also developed “species of interest” lists for the inner canyon, north rim, and south rim to aid in an evaluation of future actions in these areas. Species listed for the inner canyon that are not already considered special status include Desert bighorn sheep and native fish (flannel mouth sucker).

The potential for impacts to occur to general wildlife populations and species of interest in the inner canyon are minimized by the fact that substantial vegetation and ground disturbance would not occur at any of the corridor or backcountry toilet locations and that, with the exception of Waldron Basin, all toilets currently exist and are being used by visitors. Habitat for wildlife species would not be altered by implementation of any of the alternatives and cyclic and periodic empty/removal methods would not result in substantial disturbance to key wildlife habitat. Helicopter use for maintenance is the one method proposed for all alternatives that could disrupt wildlife populations due to the higher than normal noise

generated in the immediate vicinity of a toilet location. However, helicopter use would be periodic and infrequent, when factored in over the course of a year, and would be restricted to the period November – February. This time period is outside the breeding season of most wildlife species and minimizes the potential for disruption of breeding behavior. For these reasons, implementation of any of the alternatives would result in negligible impacts to general wildlife populations and species of interest. Therefore, this topic was dismissed from detailed analysis.

Special Status Wildlife Species. Table 1 lists threatened, endangered, proposed, and species of concern known to occur or species whose habitat may be present in the Inner Canyon. Nine federally listed wildlife and plant species are known to occur in Grand Canyon National Park. Federally listed and other special status species that have the potential to occur within the vicinity of the backcountry and corridor toilet locations are listed in Table 2.

The lists in Tables 1 and 2 were developed from personal knowledge of the area by Park biologists, Park records, the AGFD Heritage Nongame Data Management System database (2000), and Arizona Game and Fish Department and U.S. Fish and Wildlife Service biologists.

Table 1. Special Status Species of the Inner Canyon, based on known occurrences and habitat preferences, Grand Canyon National Park.

Species	Scientific Name	Status
Mexican Spotted Owl	*Strix occidentalis lucida*	T, WC
California Condor	*Gymnogyps californicus*	T*, WC
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E, WC
Bald Eagle	*Haliaeetus leucephalus*	T, WC
Peregrine Falcon	*Falco peregrinus anatum*	SC, WC
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	WC[1]
Kanab Ambersnail	*Oxyloma haydeni kanabensis*	E, WC
Northern Leopard Frog	*Rana pipiens*	WC
Humpback Chub	*Gila cypha*	E
Razorback Sucker	*Xyrauchen texanus*	E
Spotted Bat	*Euderma maculatum*	SC
Greater Western Mastiff Bat	*Eumops perotis*	WC
Pale Towsend's Big-eared Bat	*Plecotus townsendii pallescens*	SC
Grand Canyon Catchfly (plant)	*Silene rectiramea*	SC

Key: *T = federally listed as threatened under the Endangered Species Act (ESA); WC = Wildlife species of special concern in Arizona (AZ Game and Fish Department 10/14/96); SC = former species of concern to the US Fish and Wildlife Service, but for which there is no legal status (all former C2 species Fed Reg. 2/28/96); T* = federally listed as an experimental non-essential population in Arizona, but in National Parks the species is considered federally listed as threatened under ESA. WC[1] = this species is currently under a status review for possible federal listing*

Southwestern willow flycatcher/Northern leopard frog/Humpback chub: There is a confirmed breeding area for flycatchers and a leopard frog location approximately 2.5 miles downstream of the Tanner toilet site. Riparian habitat exists at the Tanner site and may be considered potential flycatcher habitat and leopard frog habitat**.** Humpback chub have also been documented in the stretch of the Colorado River near Tanner beach. Due to the fact this toilet is already an aboveground vault and does not need to be moved, ground or vegetation disturbance would not be necessary for implementation of any of the alternatives. The toilet has been in place for several years and the use level is expected to stay at current levels.

Table 2. Special Status Species Potential at Backcountry and Corridor Toilet Sites, Grand Canyon National Park.

Toilet Site	Special Status Species Potential at Site
Horseshoe Mesa	Mexican spotted owl (historic record only)
Monument Creek	None
Upper Tapeats	None
Tanner	Southwestern willow flycatcher potential habitat; Northern leopard frog potential habitat potential; Humpback chub in river
Deer Creek	None
Clear Creek	None
Salt Creek	None
Horn Creek	None
Hermit Creek	Mexican spotted owl
Waldron Basin	Mexican spotted owl; Grand Canyon catchfly
1 ½ Mile	Grand Canyon catchfly
Indian Garden	Kanab amber snail
Cedar Ridge	Mexican spotted owl; Peregrine falcon
Tipoff	Mexican spotted owl
Cottonwood	Mexican spotted owl
Roaring Springs	Roaring Springs prickly poppy
Supai Tunnel	Roaring Springs prickly poppy

Therefore, because riparian vegetation would not be disturbed as a result of this project and no changes are proposed for the current level of visitation in this area, impacts to flycatchers and leopard frogs would be negligible. No changes would occur to aquatic vegetation in this area and impacts to the humpback chub or its habitat are not expected. For this reason, these species were dismissed from detailed analysis.

Kanab Amber Snail: This species has been documented at Indian Garden Spring. There is currently some debate regarding the taxonomy of the species collected and it is possible it is not the federally listed but a different subspecies. However, for purposes of this analysis the snail documented at Indian Garden spring is considered to be the Kanab Amber Snail. The toilet at Indian Garden is not near the spring. Because there would be no change to the current location or capacity of the composting toilet at Indian Garden, there would be little potential for any habitat disturbance or direct disturbance to snails as a result of implementing any of the alternatives. No vegetation or ground disturbance would be necessary and no movements off the existing site or trails would be required. Impacts, therefore, would be negligible. For this reason, this species was dismissed from detailed analysis.

Peregrine falcon: Peregrine falcons are known to occur throughout the inner canyon, with multiple locations along the river corridor and the rims. There is one peregrine eyrie within approximately 2 miles of the Clear Creek toilet site and another eyrie near Yaki Point, within 0.5 miles of the Cedar Ridge toilet. A peregrine site is also known to occur in the vicinity of Salt Creek, but is greater than 2 miles away. Due to the fact these toilets are already in place and do not need to be moved, ground or vegetation disturbance would not be necessary for implementation of any of the alternatives. These toilets have been in place for a number of years and the use level is expected to stay at current levels. Therefore, no peregrine falcon habitat changes would occur as a result of this project. The only component of this project that has the potential to impact peregrines is the use of helicopters to periodically empty/remove the toilets. Due to the fact that these flights would only take place between

November – February, this minimizes the likelihood of disturbance to breeding peregrine falcons. Therefore, impacts to peregrine falcons are expected to be negligible from implementation of any of the alternatives. For this reason, this species was dismissed from detailed analysis.

Roaring Springs prickly poppy: This plant is known to occur along the North Kaibab trail and in the general vicinity of the Roaring Springs and Supai Tunnel toilets. Due to the fact these toilets are already in place and do not need to be moved, ground or vegetation disturbance would not be necessary for implementation of any of the alternatives for these sites. These toilets have been in place for a number of years and the use level is expected to stay at current levels. Because there would be no change to the current location or capacity of the composting toilets along the North Kaibab Trail, there would be little potential for any habitat disturbance or direct disturbance to prickly poppies as a result of implementing any of the alternatives. No vegetation or ground disturbance would be necessary and no movements off the existing site or trails would be required. For this reason, this species was dismissed from detailed analysis.

Mexican spotted owl, California condor, and Grand Canyon catchfly, species listed on the above tables are relevant to this analysis and are discussed briefly in the next section and in Chapter 3.

Environmental Justice - Executive Order 12898 requires consideration of impacts to minority and low-income populations to ensure that these populations do not receive a disproportionately high number of adverse or human health impacts. This issue was dismissed from further analysis for this project because no alternative would affect everyone equally and would not disproportionately impact minority or low-income populations.

Prime and Unique Farmland - The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in conversion of these lands to non-agricultural uses. Prime or unique farmland is defined as soil that particularly produces general crops as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables and nuts. The project areas have been evaluated by appropriate Park technical area specialists. Based on their observations, the project areas are not considered prime or unique farmland. Therefore, this topic was dismissed from further analysis.

Socioeconomic Environment – Socioeconomic values consist of local and regional businesses and residents, the local and regional economy and Park concessions. The local economy and most business of the communities surrounding the Park are based on construction, recreation, transportation, tourist sales, services, and educational research; the regional economy is strongly influenced by tourist activity. The GMP EIS discussed the socioeconomic environment and impacts extensively. There may be short-term benefits to the local and regional economy resulting from construction-related expenditures and employment. Local and regional businesses would be negligibly affected in the long-term. Therefore, impacts, both adverse and beneficial, would be negligible and thus socioeconomic values were dismissed from further analysis.

Relevant Impact Topics

Wilderness - Most of the Grand Canyon lies within proposed wilderness (Figure 2). NPS policies require that these proposed areas be managed under the provisions of the Wilderness Act. All existing backcountry toilets evaluated in this document occur in proposed wilderness areas and are managed under the guidance of the Wilderness Act, National Park Service

Management Policies, Director's Order (DO-41) Wilderness Preservation and Management, Grand Canyon National Park's General Management Plan, Grand Canyon National Park's Standard Operating Procedure (SOP-8213-004) for determining minimum requirements for management actions in proposed wilderness, and Grand Canyon's 1988 Backcountry Management Plan. The maintenance of backcountry toilets falls under the "minimum tool concept," which allows for Park superintendents to select the method or administrative practice necessary to successfully and safely accomplish the management objectives with the least impact on wilderness character and resources. A "Minimum Requirement Analysis" to determine the minimum tools or methods necessary for both the installation and long-term maintenance of these toilets in proposed wilderness is the subject of the environmental consequences sections of Wilderness, Visitor Experience, Park Operations and Soundscape impact topics in Chapter 3. A summary of the analysis presented in Chapter 3 is also included in Appendix D. Options that are evaluated in Chapter 3 include the use of helicopters, mules, backpacks, and boats, or a combination of these methods, depending on the site.

Visitor Experience – This project involves toilets used by visitors in proposed wilderness and in the corridor. The impact of the proposal on the visitor experience, including the methods evaluated for installation, maintenance, toilet type and impacts to human health and safety will be evaluated in Chapter 3.

Park Operations –The type of toilet selected, and the methods proposed for installation and maintenance of the toilets are directly tied to Park operations. The impact of the proposal on Park operations will be discussed in Chapter 3. Focal points of the analysis will include human health and safety, feasibility and cost.

Special Status Species - here are several special status species, including several threatened, endangered and proposed species that have the potential to occur in Coconino and Mohave Counties, based on information from the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and Grand Canyon National Park biologists. Representatives from these agencies met to discuss this and other Park projects in December 2000. Table 1 lists threatened, endangered, proposed, and species of concern known to occur or species whose habitat may be present in the Inner Canyon. Nine federally listed wildlife and plant species are known to occur in Grand Canyon National Park. Federally listed and other special status species that have the potential to occur within the vicinity of the backcountry and corridor toilet locations are listed in Table 2.

The lists in Table 1 and 2 were developed from personal knowledge of the area by Park biologists, Park records, the AGFD Heritage Nongame Data Management System database (2000), and Arizona Game and Fish Department and U.S. Fish and Wildlife Service biologists. Of the species listed in Tables 1 and 2, three of them are pertinent to an analysis of the alternatives presented in this document. These are as follows:

Mexican spotted owl: The proposed Waldron Basin toilet, if installed, would occur within a Mexican spotted owl (MSO) protected activity center (PAC). Other toilet locations including Hermit Creek, Cedar Ridge, Tipoff and Cottonwood occur within 0.5 miles of an MSO PAC. For these reasons, Mexican spotted owls will be analyzed in detail and are considered a relevant impact topic.

California Condor: There are no known active nests in the vicinity of any of the toilet locations nor are there previously successful condor nests in the vicinity of any toilet

locations. However, breeding attempts have been documented in the inner canyon and it is likely that nesting will be attempted again. Mitigation measures have been developed for this project that would allow for protective measures to be taken if a nest is confirmed in the vicinity of any toilet locations. Condor foraging activity occurs throughout the inner canyon and it is possible that condors may occur at toilet locations during maintenance activities or other times. California condors will be analyzed in detail and are considered a relevant impact topic.

Grand Canyon catchfly: This plant species has been documented along the Hermit trail and the Bright Angel trail and is an endemic species to Grand Canyon National Park. However, because this project proposes no changes to the corridor toilets along the Bright Angel trail and these toilets would remain in their current location and capacity, no changes to vegetation along the Bright Angel trail or near the 1 ½ mile or Indian Garden toilets would occur. Cyclic maintenance and periodic maintenance methods proposed under any of the alternatives are not expected to impact any areas outside of the existing footprint of the toilets and associated trail. However, because this species is also known to occur along the Hermit Trail, it is possible that it might also occur in the vicinity of the proposed Waldron Basin toilet site. Because this Waldron toilet does not currently exist and would require some minor ground disturbance and a spur trail from the Hermit Trail for access, Grand Canyon catchfly will be analyzed in detail and is considered a relevant impact topic.
The impact of the proposal on Mexican spotted owl, California condor and Grand Canyon catchfly will be discussed in Chapter 3.

Soundscape - The NPS is mandated by Director's Order 47 to articulate the Park Service's operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources. Natural sounds are intrinsic elements of the environment that are often associated with Parks and Park purposes. They are inherent components of "the scenery and the natural and historic objects and the wild life" protected by the NPS Organic Act. They are vital to the natural functioning of many Parks and may provide valuable indicators of the health of various ecosystems. Intrusive sounds are of concern to the NPS because they sometimes impede the Service's ability to accomplish its mission.

The proposed use of helicopters to install and periodically maintain some of the toilets would generate noise in proposed wilderness. Impacts of noise from helicopter use to the Park's soundscape will be discussed in Chapter 3.

Cultural Resources - The 1966 National Historic Preservation Act, as amended, NEPA, the 1916 NPS Organic Act, the 2001 NPS Management Policies and other NPS guidelines require consideration of impacts on cultural resources. Project undertakings have the potential to affect archaeological resources, sites of special ethnographic significance to American Indians, buildings and structures contributing to the National Register significance of historic trails and Grandview Mine Historic District, as well as other elements that contribute to the historic cultural landscape in the inner canyon. Therefore, this topic will be analyzed in Chapter 3.

ADDITIONAL NEPA ANALYSIS

The proposed action and alternatives include all reasonably foreseeable connected actions. Environmental effects estimated for this project consider the site-specific effects of all-foreseeable actions and mitigation measures. Monitoring during and following implementation of the project would occur to verify effectiveness of mitigation measures and predictions of impact. This EA will guide any subsequent project implementation. If new information or unforeseen and unanalyzed actions become necessary in the future, additional site-specific environmental analysis will be conducted before implementation.

Chapter 2 – Alternatives

INTRODUCTION

This section describes three alternatives for replacing/rehabilitating and maintaining eleven backcountry toilets and maintaining seven corridor toilets in Grand Canyon National Park. A summary table (Table 6) comparing alternative components is presented at the end of this chapter. Schematic maps of toilet locations and proposed actions under each alternative are presented in Appendices A1 – A3.

The alternative descriptions are based on preliminary designs and best information available at the time of this writing. Specific distances, areas, and layouts used to describe the alternatives are only estimates and could change during final site design. If changes during final site design were not consistent with the intent and effects of the selected alternative, then additional compliance would be needed as appropriate.

ALTERNATIVE DEVELOPMENT

From the public scoping activities, as fully described in the Management History section in Chapter 1, 25 letters and/or email responses were received. The Park Service performed a content analysis on this information, information gained from internal scoping, and information gained from scoping with other agencies. From this effort, the Park Service did not identify any additional significant issues for analysis, other than those already selected as impact topics (see Chapter 2).

The scope of this project has essentially four components: toilet type, initial toilet installation method, cyclic maintenance method, and periodic empty/removal method. The options for each of these components that were considered feasible are included in the three alternatives (Alternatives A, B and C) described in detail later in this document. Options that were considered by the interdisciplinary team, but later dismissed from detailed analysis, are described in the next section below, for each of the four project components.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

Toilet Type: The use of composting toilets for the replacement of existing backcountry toilets was considered and evaluated. It was estimated that the area of disturbance at any one site for installation of a composting toilet would be approximately 200 square feet. This option was dismissed from further detailed analysis for the following reasons:

1) Due to the size and permanency of a composting toilet, composting toilets would be considered new facilities in proposed wilderness. According to wilderness management direction, including Management Policies (2001), new facilities in wilderness should generally be avoided.
2) Composting toilets require a suitable location that provides some topographic relief/slope. There needs to be room below the toilet for the composting unit while also allowing for easy

access to the building, and access to the composting unit for maintenance. This type of situation would be difficult to find at many of the existing backcountry toilet sites.
3) Because of the size and specific location requirements as described above, it is likely that these composting units would not be able to be screened from view effectively and would likely be very noticeable on the landscape. This is not in keeping with wilderness management direction, unless deemed to be the minimum requirement necessary to carry out wilderness management objectives.

The use of chemical toilets was also considered but dismissed from detailed analysis because:

1) Chemical toilets have a smaller storage capacity than a vault or a composting toilet, requiring more frequent maintenance than would be feasible in the backcountry.
2) Transporting chemical toilets into the backcountry would be difficult.
3) Risk of vandalism is high.

Toilet Installation: The method of installation for the new units was the focus of evaluation. Installation options that were initially discussed included putting the vault units on a person's back, transporting via mule and transporting via boat. These options were dismissed from detailed analysis for the following reasons:

1) Backpacking: The vault toilets proposed are single units that cannot be disassembled. Due to their size and shape, it would be very difficult for a person to carry a unit on their back safely. Realizing the steep and rugged terrain that would need to be traversed by a person to get to the proposed sites, and the narrowness of the primitive trails in most areas, this option was not considered safe and therefore, not viable.
2) Mule Transport: For similar reasons as above, the vault toilets would be difficult to pack on a mule. Due to their size and shape and the fact that they cannot be disassembled, packing them into the inner canyon on mules would be hazardous. Safety concerns arise when mules would need to traverse steep and narrow sections of trail with large bulky units on their backs. Therefore, this option to use mules for installation of the vault units was not considered safe and therefore, not viable.
3) Boat Transport: Vault toilets could be transported to some locations via boat. However, for most sites the unit would still need to be transported from the river to the specific toilet site, requiring either mules or backpacking. For the reasons listed above, this option was not considered safe and therefore not viable.

Cyclic Maintenance Method: There were no options for cyclic maintenance that were evaluated and later dismissed from detailed analysis. Cyclic maintenance methods are included in each of the three alternatives described in detail in the next section.

Periodic Empty/Removal Methods

Mules: Some backcountry and corridor toilet sites are accessible by mule. These include all of the toilets along corridor trails (1 and ½ Mile, Indian Garden, Cedar Ridge, Tipoff, Cottonwood, Roaring Springs, and Supai Tunnel) and Tanner, Salt Creek, and Horn Creek. Mule use at all of these sites are evaluated in detail in the Alternatives described later in this Chapter, with the exception of toilets along the North Kaibab Trail (Cottonwood, Roaring Springs and Supai Tunnel). Mule use for periodic emptying/removal was dismissed from detailed analysis for these three sites for the reasons described below:

Cottonwood, Roaring Springs, and Supai Tunnel, on the North Kaibab Trail: The use of mules to periodically empty toilets at these sites was dismissed from detailed analysis. The

North Kaibab Trail is a corridor trail that is accessible by mules and visitor mule trips on this trail are routine. This trail is difficult to access in winter/spring months due to snow and ice and the trailhead is typically closed due to inaccessibility of the North Rim during snow. This means that toilet maintenance on this trail would need to occur during the same time period as the visitor use season. However, the high number of visitor mule trips and the high number of hikers on this trail presents a safety issue if mules were also used for toilet maintenance. This trail is more steep and narrow in many places than the Bright Angel or South Kaibab Trail. Adding more mule traffic to some of these steep and narrow segments of trail when potentially high numbers of visitors on mules and on foot are on the trail was considered unsafe. In addition, the Park's mule program, operated out of the maintenance division, is located on the South Rim. This would require transporting several mules by trailer hundreds of miles from the South Rim to the North Kaibab Trailhead, emptying the toilets, disposing of the waste and then trailering the mules back to the South Rim. For these reasons, mule use for periodic emptying of the corridor toilets on the North Kaibab Trail was eliminated from detailed analysis.

Mules were also preliminarily identified as an alternative to helicopter flights for periodic emptying/removal for Clear Creek, Hermit Basin, Monument Creek, and Horseshoe Mesa. An evaluation of the existing trail standards and conditions, logistics, safety considerations, and potential impacts to resources and visitor experience were discussed. These evaluations are briefly described below.

Clear Creek toilet on the Clear Creek Trail: Clear Creek is 9 miles from Phantom Ranch, the nearest place that has appropriate facilities for keeping livestock overnight. The riding time to Clear Creek and back from Phantom Ranch is 8-9 hours, requiring one night's stay at Clear Creek to be able to accomplish removal of the waste and packing it on the mules. There are currently no adequate livestock facilities at Clear Creek for mules. In addition, the Clear Creek trail does not meet current trail standards for stock use in the final traverse into the drainage and the descent to the creek is not appropriately graded or constructed to safely support the weight of livestock.

Hermit Basin toilet on the Hermit Trail: The Hermit Trail is currently impassable to livestock. The nearest place with appropriate facilities for keeping livestock overnight is Indian Garden. Indian Garden to Hermit Basin via the Hermit Trail is approximately 18 miles, which would require a night's stay at Hermit Basin. There are currently no adequate livestock facilities at Hermit Basin for mules. In addition, the Tonto Trail from Indian Garden, while passable by mules as far as Salt Creek, does not meet current trail standards for stock use on the descent into Monument Creek, and therefore, would not allow for safe mule use through Monument and further west to Hermit Basin.

Monument Creek toilet on the Hermit Trail: The Hermit Trail is currently impassable to livestock. Monument Creek is nearly 11 miles from Indian Garden, the nearest place that has appropriate facilities for keeping livestock overnight. Due to the length of riding time to Monument Creek and back, one night's stay would be required at Monument Creek. There are currently no adequate livestock facilities at Monument Creek for mules. In addition, the Tonto Trail from Indian Gardens to Monument, while passable by mules as far as Salt Creek, does not meet current trail standards for stock use on the descent into Monument Creek.

Horseshoe Mesa toilets on the Grandview Trail: The Grandview Trail is currently impassable to livestock. Horseshoe Mesa is over 25 miles from the South Kaibab Trailhead, requiring at least four days and four overnight stays just to reach Horseshoe Mesa. Each mule requires

approximately 5 gallons of water per day, and water sources along this section of the Tonto trail are seasonal at best. There is no water at Horseshoe Mesa. In addition, the Tonto Trail East to Horseshoe Mesa would require major trail work to become passable to stock in both Cremation and Grapevine Canyons, in addition to the trail being below trail width standards for stock use.

In summary, the alternative to use livestock to periodically access the toilets and pack out the waste at Clear Creek, Hermit Basin, Monument Creek and Horseshoe Mesa was dismissed from further detailed analysis, for the above reasons. While some of these sites can be accessed at least in part by corridor trails that are up to stock standards, short segments of trails not up to stock standards would have to be used. The reasons described above are summarized below:

- The work required on the trails accessing these sites to make them accessible to livestock would be extensive, and this work is not currently planned or funded
- The use of livestock in these remote and rugged locations on trails that are not up to standards would create multiple safety concerns for personnel responsible for handling the mules and conducting the work
- Lack of adequate livestock facilities at the toilet sites would likely cause damage to nearby soils and vegetation
- The labor and time involved in using stock to empty the toilets at these sites would cost substantially more than using helicopters to perform the same task.

Burros: The use of burros to periodically empty the toilets was considered by the interdisciplinary team. This option was dismissed from detailed analysis due to the following factors: 1) Grand Canyon National Park does not currently have any burros and the purchase of burros and related tack would be costly. Funding for the establishment of a burro program is currently unavailable; 2) The use of burros in the backcountry was evaluated by the Park in years past and determined to be unsuccessful due to the smaller load size that a burro can carry and difficulties with burro temperament; 3) Burros would require facilities and water at remote sites just as mules do, and the bringing burros into areas that lack adequate facilities could impact resources, and 4) Accidental reintroduction of burros into the Park is a possibility. The potential for the establishment of a wild burro herd in the Park is a concern.

Bringing Trails up to Stock Standards: The possibility of bringing some trails in the Park that are currently not up to stock standards, such as the Hermit Trail and the Grandview Trail, up to stock standards was considered by the interdisciplinary team. This was dismissed from detailed analysis due to the fact that this endeavor would be extremely costly and labor intensive. The Hermit Trail, for example, has not been up to stock standards for at least fifty years. Attempting to improve this historic trail enough to safely accommodate the use of stock was considered unrealistic considering the Park's current budgets and the direction outlined in the GMP. The GMP states that "The Hermit and Grandview Trails will be suggested as alternatives to the corridor trails for visitors with experience hiking in Grand Canyon. However, neither trail use nor maintenance will be increased to levels that will alter their status as threshold trails…." (GMP, page 55). It is possible that bringing either the Hermit or Grandview Trails up to current stock standards would also alter their status as threshold trails.

ALTERNATIVE DESCRIPTION

Alternatives are described below. A table follows each narrative description identifying the components of each alternative and a comparison table of all alternatives combined follows at the

end of the chapter. Appendices A1 – A3 contain schematic maps of each alternative for comparison purposes.

Alternative A – No Action. This alternative is summarized in Table 3 and Appendix A1. This alternative does not meet the purpose and need for the project, but provides a basis for comparison with the action alternatives. This alternative would not change the existing situation. The eleven existing backcountry toilets and the seven corridor toilets would remain in their current form and condition. No toilet would be installed in Waldron Basin, at the junction of the Hermit Trail and the Dripping Springs Trail, and the outhouses at Santa Maria Springs would remain. Substandard pit toilets would remain in use at Horseshoe Mesa, Monument Creek and Clear Creek. Substandard outhouses would remain at Salt Creek and Horn Creek. Aboveground Romtec vaults would remain in use at Upper Tapeats, Tanner and Deer Creek. Cyclic maintenance for backcountry and corridor toilets would occur as time and funding allowed. Pit and outhouse toilets would be emptied periodically by shoveling out the waste to transportable containers and either flown out via helicopter or packed out via backpack, mule, or boat depending on the site. Safety hazards associated with handling of human waste and transporting it out of the inner canyon would continue.

The no action alternative provides a basis for comparing the management direction and environmental consequences of the other action alternatives. If the no action alternative were selected, NPS would respond to future needs related to backcountry and corridor toilets without major actions or changes in course.

Alternative B – Preferred Alternative – This alternative is summarized in Table 4 and Appendix A2. Alternative B proposes the use of aboveground vault toilets in the backcountry. Components of this alternative include replacement of existing backcountry substandard pit/outhouse toilets, installation of new backcountry toilets, cyclic maintenance of backcountry and corridor toilets, and periodical empty/removal methods for backcountry and corridor toilets.

Toilet Type: As shown in the table above, some backcountry sites already have aboveground vault units and one backcountry site (Hermit Creek) has a composting toilet. Alternative B would include the replacement of existing pit toilets or outhouses at 5 backcountry sites (Horseshoe Mesa, Monument Creek, Clear Creek, Salt Creek, and Horn Creek) with aboveground vault toilets. The Monument Creek toilet(s) would be installed in a slightly different location than the existing pit toilets to facilitate its use and to avoid nearby archeological sites (see proposed site location in Figure 3). The current pit toilets would be removed and closed. The new proposed location is visible from the campground and to hikers on the trail. Archeological surveys of this site have been conducted and no sites were found. The Waldron Basin toilet would be installed near the Hermit Trail/Dripping Springs trail junction, provided this toilet is deemed necessary, as described in the mitigation measures (page 32). The proposed location for this toilet is approximately 30 meters south of the trail sign and would require a small spur trail and sign (Figure 4). Archeological surveys of this site have been conducted and no sites were found. Privacy screening would not be needed for the Waldron Basin toilet.

Vault toilets would have a capacity of approximately 95 gallons, would weigh about 100 pounds when empty**,** would have a removable lid to facilitate cleaning and servicing, would be made of material suited for long-term sun exposure, and would have an adequate venting system to allow for some composting functions. These units would be relatively small and would sit on the ground, requiring very little disturbance of the ground or surrounding vegetation. Toilets would be portable and could be removed if needed. Toilets would be similar in size and shape to those already in use at Upper Tapeats, Tanner and Deer Creek. All composting toilets would remain in their current condition.

Table 3. Alternative A: Existing Backcountry and Corridor Toilets and Current Maintenance Methods, Grand Canyon National Park. 2002.

Site	Existing Condition	Cyclic Maintenance Method	Empty/Removal Method
BACKCOUNTRY TOILETS			
Horseshoe Mesa (2)	1 pit and 1 Romtec vault	Sporadic, as time and funding allow	Helicopter flights twice a year (up to 11 flights/year)
Monument Creek	1 large pit with 2 seats	Sporadic, as time and funding allow	Helicopter flights twice a year (up to 12 flights/year)
Upper Tapeats	1 Romtec vault	Sporadic, as time and funding allow	Helicopter flights twice a year (up to 10 flights/year)
Tanner	1 Romtec vault	Sporadic, as time and funding allow	River trip typically, but helicopters used occasionally when warranted
Deer Creek	1 Romtec vault	Sporadic, as time and funding allow	Helicopter flights twice a year (up to 10 flights/year)
Clear Creek	1 pit toilet	Sporadic, as time and funding allow	Helicopter flights or mules (both have been used. When helicopters warranted, up to 5 flights/year)
Salt Creek	1 outhouse	Sporadic, as time and funding allow	Helicopter flights or mules (both have been used. When helicopters warranted, up to 4 flights/year)
Horn Creek	1 outhouse	Sporadic, as time and funding allow	Helicopter flights or mules (both have been used. When helicopters warranted, up to 4 flights/year)
Hermit Creek	1 composting toilet	Sporadic, as time and funding allow	Helicopter flights twice a year (up to 6 flights/year)
Waldron (Hermit) Basin	No toilet at this site; Santa Maria Springs has 2 outhouses	Not applicable	Not applicable

Site	Existing Condition	Cyclic Maintenance Method	Empty/Removal Method
CORRIDOR TOILETS			
One and a Half Mile (Bright Angel Trail)	1 Composting toilet	Typically checked every other day	Helicopter or mule - helicopter more typical at up to 8 flights/year
Indian Garden (Bright Angel Trail)	1 Composting toilet	Typically checked every day	Helicopter or mule – helicopter more typical at up to 16 flights/year
Cedar Ridge (South Kaibab Trail)	1 Composting toilet	Typically checked every other day	Helicopter or mule – helicopter more typical at up to 6 flights/year
Tipoff (South Kaibab Trail)	1 Composting toilet	Typically checked once a week	Helicopter or mule – helicopter more typical at up to 5 flights/year
Cottonwood (North Kaibab Trail)	1 Composting toilet	Typically checked at least once a month by crew, and more regularly by ranger	Helicopter flights at up to 10 flights/year
Roaring Springs (North Kaibab Trail)	1 Composting toilet	Typically checked by local ranger every other day	Helicopter flights at up to 10 flights/year
Supai Tunnel (North Kaibab Trail)	1 Composting toilet	Sporadic, as time and funding allow	Helicopter flights at up 4 flights/year

Screening and Tool Cache: Visual screening may need to be installed at some of the sites, depending on the vegetation screening that already exists on site. If suitable vegetative screening is available on site, no additional screening would be added. If suitable vegetative screening is not available, a small privacy screen may be added during toilet installation. This privacy screening would be temporary and portable, allowing for easy assembly and disassembly when necessary. Installation of screening would not require ground disturbance. Each vault toilet location would also be equipped with a small tool cache that would be prefabricated, temporary and portable and would also not require any additional ground disturbance. This tool cache would be used situated aboveground and used to store a few pieces of equipment necessary during monthly cyclic maintenance activities.

Installation Method: The vault toilets would be transported into the backcountry via helicopter. The crew that would be needed for the installation would access the site via mule or by foot, depending on the site's location**.** The helicopter would bring in an empty vault and would hover over the site while the ground crew released it. Although variations may occur due to differences in terrain and access at each site, this would require a helicopter to hover over the site for approximately 2-3 minutes before returning to the South Rim. The helicopter would only land in the rare event that no NPS personnel are present on the ground to perform helicopter duties. The landing site would be an area already disturbed and generally void of vegetation and would not require any substantial vegetation disturbance.

Figure 3. Proposed Location for Monument Creek Vault Toilet.

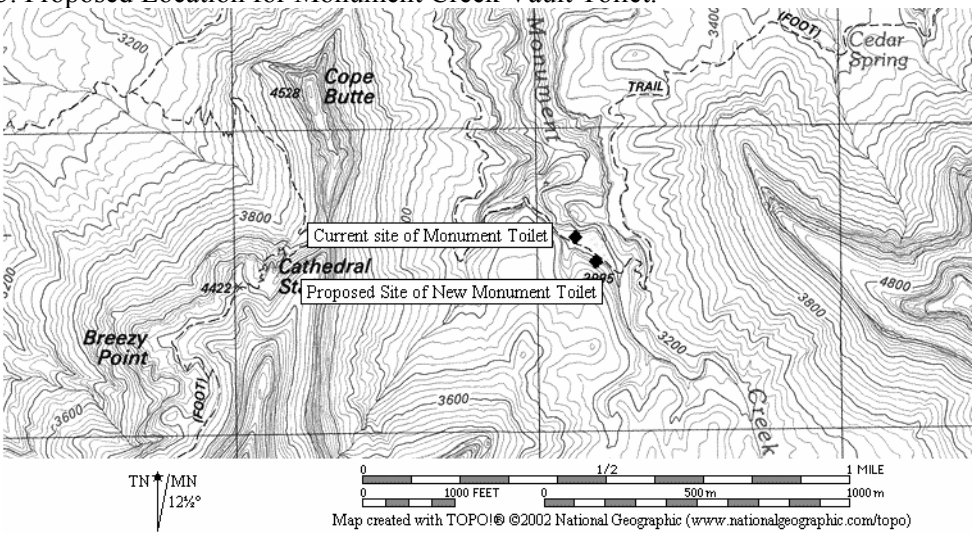

Figure 4. Proposed Location for Waldron Basin Vault Toilet.

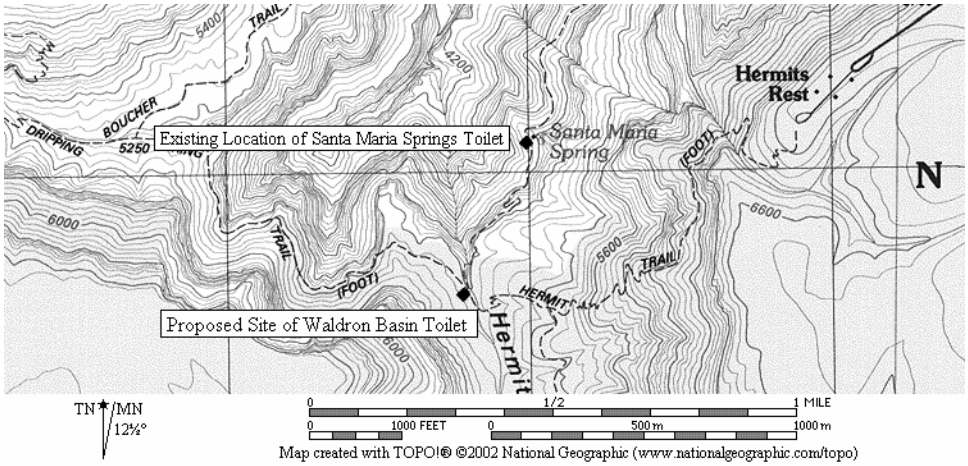

Table 4. Alternative B - Preferred: Toilet Type, Installation and Maintenance Methods, Grand Canyon National Park. 2002.

Site	Proposed Action	Installation Method	Cyclic Maintenance Method	Empty/Removal Method
BACKCOUNTRY TOILETS				
Horseshoe Mesa (2)	Remove pit, install new vault. Add screening if necessary	2 helicopter flights	By foot; monthly, year round	1-2 flights/ toilet/year
Monument Creek	Remove pit; install new vaults in slightly different location (Figure 3) to maintain current capacity (estimated at 3 units). Add screening if necessary	2 helicopter flights	By foot/river monthly	2-3 flights/ toilet/year
Upper Tapeats	Add screening if necessary; tool cache, reveg/site work	None (installed during yearly empty/removal)	By foot/river monthly (Mar – Nov)	1-2 flights/ toilet/year
Tanner	Add tool cache, reveg/site work	None (installed during yearly empty/removal)	By river/foot monthly (Mar – Nov)	1 trip/year (shovel waste into barrels, boat barrels to Phantom Ranch, then fly out waste with regularly scheduled flights to removed sludge from Phantom Ranch waste water treatment plant.
Deer Creek	Add tool cache, reveg/site work	None (installed during yearly empty/removal)	By foot/river monthly (Mar – Nov)	1-2 flights/ toilet/year
Clear Creek	Remove existing pit; install new vault, add tool cache; Add screening if necessary; reveg/site work	2 helicopter flights	By foot/mule monthly (Mar – Nov)	1-2 flights/ toilet/year

Site	Proposed Action	Installation Method	Cyclic Maintenance Method	Empty/Removal Method
Salt Creek	Remove existing outhouse; install 1 new vault, add tool cache; add screening if necessary; reveg/site work	1 helicopter flight (installed in conjunction with Horn Creek)	By mule/foot monthly	Done using mules, in conjunction with Horn Creek; helicopter when conditions warrant*
Horn Creek	Remove existing outhouse; install 1 new vault, add tool cache; add screening if necessary; reveg/site work	2 helicopter flights (installed in conjunction with Salt Creek)	By foot/mule monthly	One 5-head mule trip/year (in conjunction with Salt Creek); helicopter when conditions warrant*
Hermit Creek	No installation needed	none	By foot/river Monthly	Up to 6 flights/year (uses barrels, so needs 3 flights/trip and 2 trips/year)
Waldron (Hermit) Basin	Install new vault at Hermit Trail/Dripping Springs trail junction (Figure 4); add tool cache; add screening if necessary; reveg/site work	2 helicopter flights	By foot Monthly	1-2 flights/ toilet/year
CORRIDOR TOILETS				
One and a half Mile	Keep toilet as is	N/A	Same as Alternative A	Mules (7 days with 10 mules and 2 riders/year). Helicopter flights (up to 8 flights/year) may be used when limited staffing or severe time restraints warrant.

Site	Proposed Action	Installation Method	Cyclic Maintenance Method	Empty/Removal Method
Indian Garden	Keep toilet as is	N/A	Same as Alternative A	Helicopter flights (up to 16 flights/year)
Cedar Ridge	Keep toilet as is	N/A	Same as Alternative A	Mules (3 days with 10 mules and 2 riders/year). Helicopter flights (up to 6 flights/year) may be used when limited staffing or severe time restraints warrant.
Tipoff	Keep toilet as is	N/A	Same as Alternative A	Mules (5 days with 8 mules and 2 riders/year). Helicopter flights (up to 5 flights/year) may be used when limited staffing or severe time restraints warrant.
Cottonwood	Keep toilet as is	N/A	Same as Alternative A	Helicopter flights (up to 8 flights/year)
Roaring Springs	Keep toilet as is	N/A	Same as Alternative A	Helicopter flights (up to 10 flights/year)
Supai Tunnel	Keep toilet as is	N/A	Same as Alternative A	Helicopter flights (up to 4 flights/year)

* = helicopters would only be used for periodic empty/removal for Tanner, Horn and Salt Creeks as a last resort when the trail is washed out or some other emergency situation arises.

Cyclic Maintenance: Maintenance for each toilet would occur periodically (monthly during the busiest season) and would be conducted by personnel accessing the sites via foot, mule and/or river transport depending on the site. Cyclic maintenance activities would include such things as adding enzymes to the toilet, stirring, site work, site cleanup, pruning along the trail and obliteration of social trailing as needed.

Maintenance: Empty/Removal Method: The empty/removal method for each toilet would vary by site, and is as described in Table 4. Horseshoe Mesa, Monument Creek, Upper Tapeats, Deer Creek, Clear Creek, Hermit Creek, and Waldron Basin would utilize helicopter flights to transport in new units and transport out full units typically once a year (or, in the case of Hermit Creek, fly in barrels, and then fly out the barrels when full). Tanner, Salt Creek and Horn Creek toilets would be emptied yearly, or as deemed necessary for the level of use, and would be accessed via mule and/or boat. The number of flights necessary per site for each empty/removal trip would be about one flight/unit. Estimates on the total number of flights per site are listed in Table 4. The helicopter would bring in an empty vault, hover over the site while the ground crew released it and then hooked up the full vault for helicopter removal. Although variations may occur due to differences in terrain and access at each site, this would require a helicopter to hover over the site for approximately 2-3 minutes before returning to the South Rim. The helicopter would only land in the rare event that no NPS personnel are present on the ground to perform helicopter duties. The landing site would be an area already disturbed and generally void of vegetation and would not require any substantial vegetation disturbance.

Shoveling the waste out of the units would still be a required step for periodic maintenance, but this would occur on the rim rather than at the inner canyon site. This would require a more controlled environment for emptying out the waste and would reduce the amount of time necessary on site.

Alternative C – Backpacking – This alternative is summarized in Table 5 and Appendix A3. Alternative C also proposes the use of aboveground vault toilets in the backcountry. Like Alternative B, components of Alternative C include replacement of existing substandard vault toilets, installation of new toilets, cyclic maintenance of backcountry toilets, and periodical empty/removal methods. The primary difference between Alternative B and Alternative C is the method proposed for periodic emptying/removal, as shown in Table 3.

Toilet Type: Same as Alternative B.
Installation Method: Same as Alternative B.
Cyclic Maintenance: Same As Alternative B.
Periodic Empty/Removal Method: There are some backcountry toilets that could be shoveled out, waste transferred to portable containers and packed out to the rim via backpack or backpacked to the river and then transported via boat. Some sites where the preferred method for periodic emptying and removal is mule and/or boat are identified in Alternative B (Salt Creek, Horn Creek and Tanner) and are also carried forward as such in Alternative C. However, in addition, this alternative includes backpacking out the waste as an option for Horseshoe Mesa, Monument Creek, Upper Tapeats, Deer Creek, Clear Creek, Hermit Creek and Waldron (Hermit) Basin. These additional sites are not safely accessible by mule (see alternative dismissed above) but are accessible on foot. Backpacking out human waste from these toilets would be extremely labor intensive. An aboveground vault, weighing approximately 750 lbs when full, would require an estimated 30 backpack loads to be completely emptied. This is assuming that a person could carry approximately 25 lbs of waste on their back, along with the weight of their personal gear.

Table 5. Alternative C: Toilet Type, Installation and Maintenance Methods, Grand Canyon National Park. 2002.

Site	Proposed Action	Installation Method	Cyclic Maintenance Method	Empty/Removal Method
BACKCOUNTRY TOILETS				
Horseshoe Mesa (2)	Remove pit, install new vault. Add screening if necessary	2 helicopter flights	By foot; monthly, year round	Backpack out waste once/year; would require 30 backpack loads/toilet/year, for a total of 60 backpack loads.
Monument Creek	Remove pit; install new vaults in slightly different location (Figure 3) to maintain current capacity, estimated at 3 toilets. Add screening if necessary	2 helicopter flights	By foot/river monthly	Backpack out waste once/year; would require 30 backpack loads/toilet/year, for a total of 90 backpack loads.
Upper Tapeats	Add screening if necessary; tool cache, reveg/site work	None (installed during yearly empty/removal)	By foot/river monthly (Mar – Nov)	Backpack out waste to river (would require 30 backpack loads/toilet) and transport via river once/year
Tanner	Add tool cache, reveg/site work	None (installed during yearly empty/removal)	By river/foot monthly (Mar – Nov)	1 trip/year (shovel waste into barrels, boat barrels to Phantom Ranch, then fly out waste with regularly scheduled flights to removed sludge from Phantom Ranch waste water treatment plant.
Deer Creek	Add tool cache, reveg/site work	None (installed during yearly empty/removal)	By foot/river monthly (Mar – Nov)	Backpack out waste to river (would require 30 backpack loads/toilet) and transport via river once/year
Clear Creek	Remove existing pit; install new vault, add tool cache; Add screening if necessary; reveg/site work	2 helicopter flights	By foot/mule monthly (Mar – Nov)	Backpack out waste to Phantom Ranch and then transport via regularly scheduled mule trips to south rim (would require 30 backpack loads/toilet/year)

Site	Proposed Action	Installation Method	Cyclic Maintenance Method	Empty/Removal Method
Salt Creek	Remove existing outhouse; install 1 new vault, add tool cache; add screening if necessary; reveg/site work	1 helicopter flight (installed in conjunction with Horn Creek)	By mule/foot monthly	One 5-head mule trip/year (in conjunction with Horn Creek)
Horn Creek	Remove existing outhouse; install 1 new vault, add tool cache; add screening if necessary; reveg/site work	2 helicopter flights (installed in conjunction with Salt Creek)	By foot/mule monthly	Done in conjunction with Salt Creek
Hermit Creek	No installation needed	none	By foot/river Monthly	Backpack out waste (would require 60 backpack loads/toilet/year)
Waldron (Hermit) Basin	Install new vault at Hermit Trail/Dripping Springs trail junction (Figure 4); add tool cache; add screening if necessary; reveg/site work	2 helicopter flights	By foot Monthly	Backpack out waste once/year; would require 30 backpack loads/toilet/year.
CORRIDOR TOILETS				
One and a Half Mile	Keep toilet as is	Not applicable	Same as Alternative A	Mules: 7 days with 2 riders and 10 mules
Indian Garden	Keep toilet as is	Not applicable	Same as Alternative A	Mules: 3 weeks with 2 riders and 6-8 mules (10 separate trips)
Cedar Ridge	Keep toilet as is	Not applicable	Same as Alternative A	Mules: 3 days with 2 riders and 10 mules

Site	Proposed Action	Installation Method	Cyclic Maintenance Method	Empty/Removal Method
Tipoff	Keep toilet as is	Not applicable	Same as Alternative A	Mules: 5 days with 2 riders and 8 mules
Cottonwood	Keep toilet as is	Not applicable	Same as Alternative A	Helicopter flights (up to 10 flights/year)
Roaring Springs	Keep toilet as is	Not applicable	Same as Alternative A	Helicopter flights (up to 10 flights/year)
Supai Tunnel	Keep toilet as is	Not applicable	Same as Alternative A	Helicopter flights (up to 4 flights/year)

IDENTIFICATION OF THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which guides the Council on Environmental Quality (CEQ). The CEQ provides direction that "[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Using selection factors from the Choosing by Advantages process and through the process of internal scoping, scoping with the public and other agencies, the environmentally preferred alternative selected is Alternative B. Alternative B best meets the purpose and need for action and best addresses the overall Park Service objectives and evaluation factors. Safety concerns and health risks were important factors used in comparing the use of helicopters for installation and maintenance and the use of mules, backpacks, and shoveling/transporting human waste out of the inner canyon. While both action alternatives strive to and meet each of the 6 criteria to some extent, each alternative meets them to varying degrees. Criteria 2 and 3 above are best met by Alternative B because it more adequately addresses reducing health and safety risks to employees and visitors. Both action alternatives meet criteria 4 and 5 by replacing existing backcountry toilets with small, temporary above ground vault toilets that are suitable for their location within proposed Wilderness and would eliminate the negative impact of the some of the existing substandard pit toilets on the surrounding landscape and visitors. Both action alternatives address Criteria 6 by replacing backcountry toilets with above ground vaults that can be emptied and then reused.

No new information came forward from public scoping or consultation with other agencies to necessitate the development of any new alternatives, other than those described and evaluated in this document. Alternative B is recommended as the Preferred Alternative and meets both the Purpose and Need and the project objectives.

MITIGATION MEASURES COMMON TO ALL ACTION ALTERNATIVES

To minimize resource impacts, the integral design features (i.e. mitigation measures) below would be followed for all action alternatives, and are analyzed as part of the action alternatives. These actions were developed to lessen the potential for adverse effects of the proposed action, and have proven to be very effective in reducing environmental impacts on previous projects.

- A Revegetation Plan would be developed for the project by a landscape architect or other qualified individual, in coordination with the Park Restoration Biologist. Any revegetation efforts would use site-adapted native species and/or native seed, and Park policies regarding revegetation, site restoration and vegetation pruning would be incorporated into the plan. The plan would address, among other things, the use of native species, plant salvage potential, exotic vegetation and noxious weeds, pruning and pedestrian barriers. Policy related to revegetation (see Chapter 9) would be referenced in *NPS Management Policies (2001)*.

- To prevent and minimize the spread of exotic vegetation and noxious weeds, the Revegetation Plan mentioned above, would be followed. The following mitigation measures would be implemented, and would be incorporated into the plan:

  - Existing populations of exotic vegetation at the site would be treated before installation activities.
  - A restoration biologist or Park natural resources representative would be on-site during the toilet installation to provide input on the best location to minimize the need for any pruning or plant salvage.
  - All vegetated areas that are disturbed by installation of the vault toilets would be revegetated using site-adapted native seed and plants.
  - Post-project exotic plant monitoring should also be conducted in the project area, as time and funding allows.

- Maintain ground cover and minimize the amount of bare soil at each site as much as possible. If helicopters are used, minimizing bare soil at the sites would reduce the likelihood of dust being stirred up during helicopter use at each site.

- Personnel installing and maintaining the toilets would be informed about special status species. Installation or empty/removal activities in the area would cease if a species were discovered in the project area, until Park staff re-evaluates the project.

- If a California condor occurs at the installation or empty/removal site, activities within 90 meters (300 feet) of the bird will cease until it leaves on its own or until techniques are employed by permitted Park staff or Peregrine Fund personnel which results in the individual condor leaving the area. Condor breeding area restrictions may be necessary for sites where helicopters are proposed for installation and/or maintenance. Based on the most current information as of January 2003, restrictions may be necessary for Horn Creek, Upper Tapeats, Indian Garden, Cedar Ridge and/or Tipoff. If a situation arises where toilet installation or periodic removal by helicopter is deemed necessary during the condor breeding season, the park biologist would be consulted and a determination made on whether flights can occur in this area, pending evaluation of the most current condor locations.

- Personnel conducting the work will be informed to not interact with condors and to immediately contact the appropriate Park or Peregrine fund personnel when condor(s) occur at the construction site.

- If previously unknown archeological resources are discovered during installation, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and an appropriate mitigation strategy developed, if necessary, in accordance with the stipulations of the 1995 *Programmatic Agreement Among the National Park Service, the Arizona State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the General Management Plan/Environmental Impact Statement, Grand Canyon National Park, Arizona*.

- All workers would be informed of the penalties for illegally collecting artifacts or intentionally damaging any archeological or historic property. Workers would also be informed of the correct procedures if previously unknown resources were uncovered during construction activities. Data recovery excavations would be carried out to mitigate adverse affects as outlined in the section on environmental consequences.

- Should unknown buried deposits be located, work would be halted and the Park Archeologist would be consulted immediately. Future actions, depending on the type of discovery, may include data recovery excavations guided by a project-specific research design. Additionally, the NPS would begin consultations under the Native American Graves Protection and Repatriation Act in the event that buried human remains is discovered during archeological excavations or project development.

- Helicopter installation of vault toilets and periodic emptying/removal would be scheduled during the off-peak backcountry season, to minimize disturbance to visitors**.** The flight path selected for the installation and periodic emptying/removal of the units would be evaluated so as to minimize the time that the helicopter is in the canyon, i.e. dog-leg flight paths that stay over forested areas the longest, and using one quick direct flight to the site only could minimize the noise disturbance generated in the inner canyon.
- Operation of helicopters would not occur between 5 PM and 8 AM year-round and would not occur on weekends or holidays, unless additional time is authorized by Park management, to minimize the impacts of noise from helicopter use to backcountry users and the Canyon's natural quiet.
- The quiet technology (MD-900) helicopter would be used for all backcountry and corridor toilet maintenance, unless unforeseen circumstances exist (aircraft in for maintenance, etc).
- Helicopter use during non-peak backcountry season for most sites would also correspond to a period outside of the Mexican Spotted Owl (MSO) breeding season. Helicopter use would not occur at any of the toilet sites during the MSO breeding season (March 1 – August 31) to minimize the potential for disturbance to breeding MSO's in the inner canyon. If a situation arises where toilet installation or periodic removal is deemed necessary during the MSO breeding season, the park biologist would be consulted and a determination made on whether flights can occur in this area, pending evaluation of the most current MSO occurrence records and protected activity center (PAC) locations.
- Visitor use monitoring would occur prior to installation of a toilet at Waldron Basin. The results of this monitoring would be used to determine if a toilet is truly necessary at this site. The indicators for toilet necessity would be the same as those already used for existing campground monitoring. If monitoring indicates that a toilet is necessary:
  - further evaluation of the location and the toilet's potential impact to Mexican spotted owls would be conducted. Consultation with the U.S. Fish and Wildlife Service and State Historic Preservation Officer would occur to evaluate the potential for impact of the installation of a new toilet within a protected activity center (PAC) and its associated cyclic and periodic maintenance methods.
  - Surveys for the occurrence of Grand Canyon catchfly in the area would occur. If individuals of this species are detected during surveys, they would be avoided. Consultation with the Park's Vegetation Program Manager would occur prior to installation.
  - Further evaluation of the location and the toilet's potential impact to the historic Hermit Trail would be conducted and documented on an Assessment of Effects form (AEF). Consultation would be initiated with the State Historic Preservation Officer.

- Explore options for informing backcountry and river users in advance when and where toilet maintenance would be occurring at the time of their visit. Checking with the Backcountry Information Center regarding registered users in relevant Use Areas would allow for a list of visitors potentially impacted by scheduled maintenance. Advising river users prior to their departure from Lee's Ferry should also be explored for feasibility, and implemented if possible.

Alternatives and Project Objectives: The objectives of the action are as described in Chapter 1 of this document. These are:

1) To provide serviceable toilets in the backcountry and in the Cross-Canyon corridor
2) To minimize ground disturbance and vegetation disturbance at each site
3) To minimize the visual impact of new backcountry toilets and maximize compatibility with wilderness direction and management.
4) To maximize the length of time necessary between maintenance trips for all backcountry and corridor toilets.

The action Alternatives B and C meet all objectives to some degree. The no action alternative does not meet Objective 1 nor Objective 4. Because the cyclic maintenance methods are the same for Alternatives B and C, Objective 4 is equally achieved by these alternatives. Because the type of toilet proposed for installation is the same for Alternatives B and C, Objective 1 is equally met by both action alternatives. Alternative B goes further than Alternative C in addressing the ease of servicing (periodic empty/removal method) by allowing for helicopter use at more sites. Using helicopters is a more efficient servicing method for some sites than periodic servicing via backpack. Alternatives B and C both achieve Objective 3 by minimizing the visual impact of the new toilets since both propose similar low profile, small, essentially temporary vault toilets. The degree to which compatibility with wilderness direction and management is met varies between Alternative B and C in the method proposed for periodic emptying/removal. It has been determined that Alternative B is the minimum tool for achieving these project objectives, although Alternative C includes other methods (backpacking) for empty/removal that are feasible. These were not selected as the preferred alternative due to safety concerns, health risks, and the extremely labor-intensive effort involved in backpacking out human waste from remote backcountry locations.

Table 6. Summary of Alternative Components (* Note: cyclic maintenance is included in the alternatives and is as described for each alternative in Tables 3, 4 and 5)

Site	ALTERNATIVE A Existing	Empty/Removal	ALTERNATIVE B – PREFERRED Site Action	Empty/Removal	ALTERNATIVE C Site Action	Empty/Removal
BACKCOUNTRY TOILETS						
Horseshoe Mesa (2)	1 pit and 1 Romtec vault	Helicopter at least twice a year (up to 11 flights/year)	Remove pit, install new vault using helicopter. Add screening if necessary	1-2 flights/ toilet/year	Same as Alternative B	Backpack out waste (30 backpack loads/toilet/year), for a total of 60 backpack loads/year.
Monument Creek	1 large pit with 2 seats	Helicopter (up to 12 flights/year)	Remove pit; install new vaults in slightly different location using helicopter (Figure 3) to maintain current capacity (estimated at 3 toilets). Add screening if necessary	1-2 flights/ toilet/year	Same as Alternative B	Backpack out waste (30 backpack loads/toilet/year) for a total of 90 backpack loads/year.
Upper Tapeats	1 Romtec vault	Helicopter (up to 10 flights per year)	Add screening if necessary; tool cache, reveg/site work during yearly empty/removal trip	1-2 flights/ toilet/year	Same as Alternative B	Backpack out waste to river (30 backpack loads/toilet) and transport via river once/year
Tanner	1 Romtec vault	River trip	Add tool cache, reveg/site work during yearly empty/removal trip	1 trip/year (shovel waste into barrels, boat barrels to Phantom Ranch, then fly out waste with regularly scheduled flights to remove sludge from Phantom Ranch waste water treatment plant.	Same as Alternative B	Same as Alternative B
Deer Creek	1 Romtec vault	Helicopter (up to	Add tool cache, reveg/site work during	1-2 flights/ toilet/year	Same as Alternative B	Backpack out waste to river (30

Site	ALTERNATIVE A Existing	Empty/Removal	ALTERNATIVE B – PREFERRED Site Action	Empty/Removal	ALTERNATIVE C Site Action	Empty/Removal
		10 flights/year)	yearly empty/removal trip			backpack loads/toilet) and transport via river once/year
Clear Creek	1 pit toilet	Helicopter or Mules (both have been used. When helicopters warranted, up to 5 flights/year)	Remove existing pit; install new vault using helicopter; add tool cache; add screening if necessary; reveg/site work	1-2 flights/ toilet/year	Same as Alternative B	Backpack out waste (30 backpack loads/toilet/year) to Phantom Ranch and transport via regularly scheduled mule trips from Phantom to the south rim.
Salt Creek	1 outhouse	Helicopter or Mules (both have been used. When helicopters warranted, up to 4 flights/year)	Remove existing outhouse; install 1 new vault using helicopter; add tool cache; add screening if necessary; reveg/site work	Done using mules, in conjunction with Horn Creek	Same as Alternative B	Same as Alternative B
Horn Creek	1 outhouse	Helicopter or Mules (both have been used. When helicopters warranted, up to 4 flights/year)	Remove existing outhouse; install 1 new vault using helicopter; add tool cache; add screening if necessary; reveg/site work	One 5-head mule trip/year (in conjunction with Salt Creek)	Same as Alternative B	Same as Alternative B
Hermit Creek	1 composting toilet	Helicopter (up to 6 flights/year)	No installation needed	Up to 6 flights/year (uses barrels, so needs 3 flights/trip and 2 trips/year)	Same as Alternative B	Backpack out waste (would require 60 backpack loads/toilet/year)

Site	ALTERNATIVE A Existing	Empty/Removal	ALTERNATIVE B – PREFERRED Site Action	Empty/Removal	ALTERNATIVE C Site Action	Empty/Removal
Waldron (Hermit) Basin	No toilet at this site; Santa Maria springs has 2 outhouses	Not applicable	Install new vault at Hermit Trail/Dripping Springs trail junction (Figure 4) using helicopter; add tool cache; add screening if necessary; reveg/site work	1-2 flights/ toilet/year	Same as Alternative B	Backpack out waste (30 backpack loads/toilet/year)
SUMMARY	**10 BACKCOUNTRY SITES**	**HELICOPTER FOR 8 SITES (up to 62 flights/year)**	**11 SITES; 6 SITES REPLACED WITH ABOVEGROUND VAULTS**	**HELICOPTER FOR 7 SITES (up to 24 flights/year, a 61% reduction over existing program)**	**11 SITES; 6 SITES REPLACED WITH ABOVEGROUND VAULTS**	**NO HELICOPTER FLIGHTS**
CORRIDOR TOILETS						
One and a Half Mile (Bright Angel Trail)	1 composting toilet	Helicopter or mule; helicopter more typical at up to 8 flights/year	Same as Alternative A - no changes proposed	Mules (7 days with 10 mules and 2 riders/year) or helicopter. Helicopter would be used if limited staffing or time constraints warrant	Same as Alternative A - no changes proposed	Mules (7 days with 10 mules and 2 riders/year)
Indian Garden (Bright Angel Trail)	1 composting toilet	Helicopter or mule; helicopter more typical at up to 16 flights/year	Same as Alternative A - no changes proposed	Helicopter (up to 16 flights/year)	Same as Alternative A - no changes proposed	Mules (3 weeks with 2 riders and 6-8 mules; 10 separate trips)

Site	ALTERNATIVE A Existing	Empty/Removal	ALTERNATIVE B – PREFERRED Site Action	Empty/Removal	ALTERNATIVE C Site Action	Empty/Removal
Cedar Ridge (South Kaibab Trail)	1 composting toilet	Helicopter or mule; helicopter more typical at up to 6 flights/year	Same as Alternative A - no changes proposed	Mules (3 days with 10 mules and 2 riders/year) or helicopter. Helicopter would be used if limited staffing or time constraints warrant	Same as Alternative A - no changes proposed	Mules (3 days with 10 mules and 2 riders/year)
Tipoff (South Kaibab Trail)	1 composting toilet	Helicopter or mule; helicopter more typical at up to 5 flights/year	Same as Alternative A - no changes proposed	Mules (5 days with 8 mules and 2 riders/year) or helicopter. Helicopter would be used if limited staffing or time constraints warrant	Same as Alternative A - no changes proposed	Mules (5 days with 8 mules and 2 riders/year)
Cottonwood (North Kaibab Trail)	1 composting toilet	Helicopter (up to 10 flights/year)	Same as Alternative A - no changes proposed	Helicopter (up to 10 flights/year)	Same as Alternative A - no changes proposed	Same as Alternative B
Roaring Springs (North Kaibab Trail)	1 composting toilet	Helicopter (up to 10 flights/year)	Same as Alternative A - no changes proposed	Helicopter (up to 10 flights/year)	Same as Alternative A - no changes proposed	Same as Alternative B
Supai Tunnel (North Kaibab Trail)	1 composting toilet	Helicopter (up to 4 flights/year)	Same as Alternative A - no changes proposed	Helicopter (up to 4 flights/year)	Same as Alternative A - no changes proposed	Same as Alternative B
SUMMARY	**7 CORRIDOR SITES**	**HELICOPTER FOR 7 SITES (up to 59 flights/year)**	**7 SITES – NO CHANGES IN EXISTING FACILITIES**	**HELICOPTER FOR 4 SITES (up to 40 flights/year, a 32% reduction over existing program)**	**7 SITES – NO CHANGES IN FACILITIES**	**HELICOPTER FOR 3 SITES (up to 24 flights/year, a 59% reduction over existing program)**

Table 7. Comparative Summary of Environmental Impacts.

Impact Topic	Alternative A	Alternative B	Alternative C	Cumulative Impacts
Wilderness	No alteration of areas proposed for wilderness designation and no changes to proposed wilderness boundaries.	No alteration of areas proposed for wilderness designation and no changes to proposed wilderness boundaries. Potential for impacts to wilderness resources and character are as described in Soundscape, Special Status Species and Visitor Experience topics.	No alteration of areas proposed for wilderness designation and no changes to proposed wilderness boundaries. Potential for impacts to wilderness resources and character are as described in Soundscape, Special Status Species and Visitor Experience topics.	No changes to backcountry use area designations or the potential for areas to be designated as wilderness in the future. No alteration of areas proposed for wilderness designation and no changes to proposed wilderness boundaries. Potential for impacts to wilderness resources and character are as described in Soundscape, Special Status Species and Visitor Experience topics.
Visitor Experience	Visitor Experience would generally remain the same; no changes in backcountry use areas or encounter levels; short-term moderate adverse impacts from increased noise due to occasional administrative helicopter use and substandard pit toilets and outhouses at 6 backcountry sites.	No changes in backcountry use areas or encounter levels; moderate long-term beneficial impacts from replacement of substandard backcountry toilets with aboveground vaults and substantial reduction in the number of helicopter flights necessary for maintenance; moderate short-term adverse impacts from increased noise due to administrative helicopter use.	No changes in backcountry use areas or encounter levels; moderate long-term beneficial impacts from replacement of substandard backcountry toilets with aboveground vaults and substantial reduction in the number of helicopter flights necessary for maintenance; moderate short-term adverse impacts from increased presence of maintenance crews on backcountry trails when backpacking waste out.	Moderate long-term beneficial impacts due to implementation of several projects designed to improve visitor facilities in the backcountry. Moderate short-term adverse impacts during construction/implementation periods.
Park Operations	Park Operations would generally remain the same; no changes in existing facilities or maintenance methods; Substandard backcountry toilets would not be replaced and would pose safety and health risks to Park employees; long-term	Moderate long-term beneficial impacts from replacement of substandard backcountry toilets with aboveground vaults that are easier to maintain and cyclic maintenance program designed to maximize length of time between maintenance	Moderate long-term beneficial impacts from replacement of substandard backcountry toilets with aboveground vaults that are easier to maintain and cyclic maintenance program designed to maximize length of time between maintenance	Moderate long-term beneficial impacts due to implementation of several projects that would minimize maintenance needs for some backcountry trails, toilets and other facilities; Minor to moderate short-term impacts during project implementation periods while Park staff implementing multiple projects.

Impact Topic	Alternative A	Alternative B	Alternative C	Cumulative Impacts
	moderate adverse impacts due to increased maintenance needs and higher costs of administrative helicopter flights.	trips.	trips; Moderate long-term adverse impact due to increased labor, cost and safety concerns with backpacking out waste from backcountry sites	
Mexican Spotted Owl	Negligible to minor impacts due to continued implementation of current program, with adherence to breeding season restriction on helicopter flights; Section 7 determination – No Effect	Moderate adverse impact due to the potential for the Waldron Basin toilet to be installed within a PAC; This installation assumes consultation with FWS prior to installation and assumes the Section 7 determination would be May Affect, Not Likely to Adversely Affect; all other aspects of proposal, with adherence to breeding season restriction on helicopter flights, would be No Effect	Same as Alternative B	Minor adverse impacts due to the fact that on-going and future projects would be evaluated for impacts to MSO and mitigated through adherence to breeding season restrictions on helicopter flights and appropriate restrictions on any construction activities nearby occupied habitat. Planned projects would not result in direct MSO habitat disturbance.
California Condor	Negligible to minor impacts due to continued implementation of current program, with adherence to mitigation measures; Section 7 determination – No Effect	Same as Alternative A	Same as Alternative A	Minor to moderate adverse impacts due to the fact that on-going and future projects would be evaluated for impacts to condors and mitigated through adherence to appropriate mitigation measures during construction activities; increased construction-related activities however would increase the likelihood of condors being attracted to these sites and interacting with humans. Planned projects would not result in direct condor habitat disturbance
Grand Canyon Catchfly	Negligible impacts with continued implementation of current program	Minor adverse impact due to the potential for the Waldron Basin toilet to be installed in	Same as Alternative B	Planned and future projects would occur in previously disturbed areas and generally would not occur in potential habitat for

Impact Topic	Alternative A	Alternative B	Alternative C	Cumulative Impacts
		suitable habitat for this species; this installation assumes a survey of the proposed toilet area for species occurrence and avoidance if possible.		this species. Minor adverse impacts may occur due to incidental disturbance to individuals or habitat not surveyed.
Soundscape	Moderate short-term adverse impacts to the Canyon' natural quiet (soundscape) would result from increased noise due to occasional administrative helicopter use in the backcountry; Minor long-term impacts due to the fact that helicopter use would be occasional and when factored into the larger landscape (all proposed wilderness areas in the Park) would be difficult to measure or quantify	Minor to moderate short-term adverse impacts from increased noise due to occasional administrative helicopter use in the backcountry; Minor long-term impacts due to the fact that helicopter use would be occasional and when factored into the larger landscape (all proposed wilderness areas in the Park) would be difficult to measure or quantify. Impacts would be somewhat less than Alternative A due to the lower number of flights proposed for this alternative.	Minor short-term and long-term impacts from increased noise due to occasional administrative helicopter use in the backcountry. Impacts would be less than Alternative A or B due to the lower number of flights proposed for this alternative.	Moderate long-term impacts are likely on-going due to daily aircraft overflights. Combining overflights, emergency aircraft flights, and planned administrative helicopter use for future projects would not bring the impacts above a moderate level.
Cultural Resources	Minor long-term adverse impacts through continued use of historic trails to access toilets for cyclic and periodic maintenance and the continued presence of the Monument toilet in a documented archeological site.	Occasional, localized, and minor adverse impacts due to the use of mules to periodically maintain toilets. Minor beneficial impact to archeological site at Monument Creek with toilet relocation. Section 106 determination: No historic properties affected.	Occasional, localized, and minor adverse impacts due to the use of personnel to backpack waste out periodically. Minor beneficial impact to archeological site at Monument Creek with toilet relocation. Section 106 determination: No historic properties affected.	Adverse cumulative impacts would be moderate, localized and long-term. Beneficial cumulative impacts from implementing planned projects designed to rehabilitate or protect structures would be minor to moderate.

Chapter 3 – Affected Environment and Environmental Consequences

INTRODUCTION

This Chapter describes the present condition (i.e. affected environment) within the project area and the changes (i.e. environmental consequences) that can be expected from implementing the action alternatives or taking no action at this time. The no action alternative sets the environmental baseline for comparing the effects of the other alternatives. The impact topics (see Chapter 1) define the scope of the environmental concern for this project. The environmental effects, or changes from the present baseline condition, described in this chapter reflect the identified relevant impact topics, and include the intensity and duration of the action, mitigation measures and cumulative effects.

The National Environmental Policy Act (NEPA) requires that environmental documents disclose the environmental impacts of proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented.

Grand Canyon National Park encompasses approximately 1.2 million acres in northern Arizona, on the southern end of the Colorado Plateau (Figure 1). A 277-mile stretch of the Colorado River runs through the Park, and thousands of miles of tributary side-canyons are included within its boundaries. The Park contains several major ecosystems from mixed Mohave desertscrub of the lower canyon to the coniferous forests of the North Rim. Of the approximately 1.2 million acres contained within the Park, approximately 1,179,700 acres are considered backcountry. This includes proposed wilderness areas and the cross-canyon corridor.

Methodology

The impact analysis and conclusions contained in this chapter were based on Park staff knowledge of the resources and site; review of existing literature and Park studies; information provided by specialists within the National Park Service and other agencies; and professional judgement. Detailed information on natural and cultural resources in Grand Canyon National Park that is summarized in the 1995 GMP and associated Environmental Impact Statement (EIS) was specifically referenced for information on affected resources in the project area.

Potential impacts in this chapter are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local or even regional?), duration (are the effects short-term or long-term?), and intensity (negligible, minor, moderate or major). Because definitions of intensity can vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this EA.

For purposes of impact analysis in this Chapter, the following definitions of duration are used to characterize impacts discussed.

- Short-term – temporary effects typically confined to the implementation/installation period.
- Long-term – more permanent effects that will remain following construction.

CUMULATIVE IMPACTS

Cumulative impact is defined as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a period of time (40 CFR 1508.7). Therefore, it is necessary to identify other ongoing or foreseeable future actions within the vicinity of the project area.

A cumulative impact analysis was conducted for the full implementation of the GMP and is documented in the EIS. The general finding in the EIS for cumulative effects to natural resources was a net reduction in natural habitat within the Park and the region, but a net reduction less than that for two other alternatives analyzed. Cumulative effects to archeological resources could occur, specifically to traditional cultural properties, but a planned ethnographic survey program would minimize this likelihood. Cumulative effects were not expected to historic structures under the assumption that existing cultural resources within the Park would be protected and preserved and some historic buildings would be rehabilitated and restored. Cumulative effects to visitor experience in the Park under implementation of the GMP was positive overall by providing additional food service and accommodations, and by contributing to regional and national efforts to expand informational resources, expand interpretive and educational opportunities, and to disperse tourism in the area. Because the GMP was a general concept plan and because it required that site-specific analysis be conducted for projects identified in the GMP when being planned, a cumulative effects analysis that is more specific to applicable impact topics pertaining to the inner canyon is needed.

For this analysis, foreseeable future actions were considered to be actions that could occur in the inner canyon backcountry (proposed wilderness in the inner canyon and cross-canyon corridor) within the next 5 years, which currently have funding or for which funding is being sought. Five years was selected as the period for foreseeable future actions because the Park's General Management Plan would likely be reassessed and the Park is expected to have a finalized Backcountry Management Plan by that time. The Park has been directed by the Unites States District Court (Grand Canyon Private Boater's Ass'n v. Alston, Case No. CV-00-1277-PCT-PGR-TSZ, 2/5/02) to issue a Notice of Intent to revise the Park's Backcountry Management Plan by the end of 2005, with possible completion of the plan by 2007-2008. Management direction for this area could change as a result of a new Backcountry Management Plan and/or a new General Management Plan. Other areas in the Park (developed areas of the North and South Rims) were not considered in the cumulative impact analysis due to the fundamental differences in management direction for these areas. Foreseeable future actions that have occurred include approximately twelve projects and are listed and discussed briefly in Appendix E.

IMPAIRMENT OF PARK RESOURCES OR VALUES

In addition to determining the environmental consequences of implementing the alternatives, National Park Service policy (*Management Policies 2001*) requires analysis of potential effects to determine whether actions would impair Park resources.

The fundamental purpose of the national Park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve Park resources and values. National Park Service managers must always seek ways to avoid, or to

minimize to the greatest degree practicable, adverse impacts on Park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to Park resources and values when necessary and appropriate to fulfill the purposes of a Park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within Parks, that discretion is limited by the statutory requirement that the National Park Service must leave Park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of Park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any Park resource or value may constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park;
- key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or
- Identified as a goal in the Park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the Park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the Park. The potential for impairment is discussed for each resource for each alternative in this chapter and a statement summarizing the conclusions of this evaluation is included in the conclusion statement at the end of the environmental consequences section for each resource in this chapter.

WILDERNESS

Affected Environment

Most of the Grand Canyon lies within proposed wilderness (Figure 2). NPS policies require that these proposed areas be managed under the provisions of the Wilderness Act. The Wilderness Act of 1964 required all federal land management agencies to reexamine their resources for possible wilderness classification. In 1976, the NPS prepared a draft environmental statement (ES) and preliminary wilderness proposal that was reviewed by the public. This recommendation included a designation of 980,088 acres in Grand Canyon National Park (approximately 80% of the Park) and was forwarded to the Department of Interior in 1980. An additional 131,814 acres, approximately 11% of the Park, was also proposed for potential wilderness designations. In 1993, the Park conducted an internal review and update of the 1980 Wilderness Recommendation and some revisions were made including a refinement of the acreage estimates determined by Geographical Information Systems (GIS). All modifications were consistent with the intent of the 1980 recommendation. In 1993, the Superintendent transmitted this recommendation to the Director of the National Park Service (NPS 1998). Action on this recommendation is still pending. However, the Park continues to manage all areas proposed for wilderness designation as wilderness, according to the direction in DO-41.

All existing backcountry toilets evaluated in this document occur in proposed wilderness areas and are managed under the guidance of the Wilderness Act, National Park Service Management Policies, Director's Order (DO-41) Wilderness Preservation and Management, Grand Canyon National Park's General Management Plan, Grand Canyon National Park's Standard Operating

Procedure (SOP-8213-004) for determining the minimum requirement for management actions in proposed wilderness, and Grand Canyon's 1988 Backcountry Management Plan. As discussed briefly in Chapter 1, a Draft 1998 Wilderness Management Plan has been prepared but has not yet been approved. As also discussed previously, the park will undertake an effort to revise the Backcountry Management Plan beginning with the issuance of a Notice of Intent by the end of 2005.

All existing corridor toilets evaluated in this document occur in the cross-canyon corridor, outside of proposed wilderness, and are managed under the guidance of Grand Canyon National Park's General Management Plan and Grand Canyon's 1988 Backcountry Management Plan. Standard Operating Procedures for determining minimum requirements for management actions in proposed wilderness can sometimes apply to actions in the corridor, depending on the scope of the project, type of activity, and potential for impacts.

Environmental Consequences

Effects Common to All Alternatives

Direct/Indirect: The maintenance of backcountry toilets falls under the "minimum tool concept," which allows for Park superintendents to select the method or administrative practice necessary to successfully and safely accomplish the management objectives with the least impact on wilderness character and resources. A "Minimum Requirement Analysis" to determine the minimum tools or methods necessary for both the installation and long-term maintenance of these toilets in proposed wilderness is the subject of the Visitor Experience, Park Operations and Soundscape impact topics included later in this Chapter. A summary of this analysis is also included in Appendix D, the Minimum Requirement Analysis Worksheet.

None of the alternatives includes any alteration of the areas proposed for wilderness designation and would not result in any changes to proposed wilderness boundaries in the Park.

A new toilet is proposed in Waldron Basin, but this toilet would essentially be a replacement of the historic toilets that currently exist at Santa Maria Springs. The Santa Maria Springs toilets are difficult to access, not widely known, and difficult to maintain. Toilets at this location also do not address the needs of day hikers into Waldron Basin. Therefore, although the Waldron Basin toilet would be a new toilet in the backcountry, it would still be in keeping with use area designations in the 1988 Backcountry Management Plan and would still keep the number of toilets in the backcountry static, as Santa Maria Springs toilets would be "closed". The potential for impacts to wilderness resources and character (soundscape, special status species) is discussed later in this Chapter and the potential for impacts to visitor experience in proposed wilderness is also discussed later in Chapter. The various methods for installation and maintenance of the toilets in terms of feasibility, cost and safety, is discussed under Park Operations later in this Chapter.

Cumulative: Combining this proposal with implementation of past and reasonably foreseeable future actions, as described in Appendix E, would not result in changes to backcountry use area designations or the potential for areas to be designated as wilderness at some point in the future. None of the alternatives nor any foreseeable future actions includes any alteration of the areas proposed for wilderness designation and would not result in any changes to proposed wilderness boundaries in the Park.

Impairment: Direct, indirect, and cumulative impacts to wilderness would be negligible as a result of implementing any of the alternatives. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation

of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wilderness resources or Park values.

Conclusions: None of the alternatives includes any alteration of the areas proposed for wilderness designation and would not result in any changes to proposed wilderness boundaries in the Park. Implementation of any of the alternatives would be in keeping with use area designations in the 1988 Backcountry Management Plan and would keep the number of toilets in the backcountry static. The potential for impacts to wilderness resources and character (soundscape, special status species), park operations and visitor experience is discussed under separate impacts topics later in this Chapter.

VISITOR EXPERIENCE

Affected Environment

Grand Canyon backcountry and wilderness areas are comprised of four management zones: Corridor, Threshold, Primitive, and Wild. These zones are based on criteria including the type and amount of use, opportunity for solitude, current resource conditions, and management uses. Visitor experience, as it relates to this proposal, includes visual quality, noise, and encounter levels. Other aspects of visitor experience, such as accessibility, recreation opportunities, and orientation would generally not be affected by the proposal.

Corridor – The Cross-Canyon Corridor is a developed inner-canyon area with campgrounds and facilities. This area is not included in proposed wilderness. The Bright Angel, South Kaibab, and North Kaibab trails provide access to developed areas and act as thresholds to the wilderness use areas. Corridor trails are heavily used by day hikers and backpackers and there are high numbers of trail encounters with hikers and mule riders. There is a high probability of camping within site and sound of other groups in campgrounds. Opportunities for solitude are unlikely.

Visual character of the corridor zone is a modified natural nonwilderness environment with high impact levels from heavy recreational use. Facilities (like toilets, campgrounds, shade structures, residences, etc.) are common.

Threshold – This zone includes approximately 24% of the wilderness use areas. Threshold areas are managed for moderate to high levels of use relative to wilderness. Camping in designated sites or at large, depending on the use area, is characteristic of threshold zones. Toilets exist at most areas. Use area limits range from six overnight campers to 40 overnight campers. Access trails to use areas are used frequently by day hikers. There is a high probability of frequent encounters with backpackers and river users and a high probability of camping within site or sound of others during primary use periods. Opportunities for solitude often exist during non-peak periods.

Visual character of the threshold zones includes a natural setting with moderate to high impacts from recreational use. Facilities (like toilets) are common in high use areas.

Primitive – This zone includes approximately 50% of the wilderness use areas. Primitive areas provide a more isolated and remote experience and are managed for low to moderate use. Camping is at-large except in rare cases where campsites may be temporarily designated for resource protection. Toilets are not common and are installed as a last resort to correct human waste problems. The maximum number of overnight users permitted per use area is 29. Frequent

encounters on threshold trails are probable, becoming less frequent with remoteness. Encounters with hikers and river users are infrequent except at popular beaches. Increased opportunities for solitude exist year-round especially during non-peak use periods.

Visual character of the primitive zone is a natural environment with low to moderate impacts from recreational use. Facilities (like toilets) are rarely encountered.

Wild – This zone includes approximately 26% of the wilderness use areas. Wild areas are mostly remote and provide the greatest opportunities for solitude. No structures of any kind, including toilets, are permitted. The maximum number of overnight users permitted per use area is 12. Infrequent to no contacts with others except near trailheads and along river is characteristic. Outstanding opportunities for solitude exist.

Visual character of the wild zone includes a natural setting with minimal impacts from recreational use. Facilities (like toilets) are not encountered.

Colorado River – The peak use period for river users is May – September annually. Moderate river use occurs during October and April. The low use period on the river is generally from November – March. The non-motorized use period for the Colorado River occurs from September 16 – December 15. Three backcountry toilets, Deer Creek, Tapeats and Tanner, are in areas where river users have greater potential for being impacted by toilet maintenance activities.

All of the backcountry toilets occur in the Threshold zone, with the exception of Tanner. Tanner occurs in the Primitive Zone. All corridor toilets are managed as part of the cross-canyon corridor in the Corridor Zone.

Human Health and Safety: There are risks to human health and safety associated with the use of backcountry and corridor toilets and the methods used by park personnel to maintain them. These include: 1) risks associated with exposing visitors to unsanitary conditions at existing substandard pit toilets and outhouses that are difficult to maintain in a timely manner, and 2) risks associated with being in proximity to Park personnel while servicing a toilet or hiking on the same trail as Park personnel backpacking human waste out of the canyon. Risks to visitors are also associated with mule transport of waste on the same trials as hikers and helicopter transport of waste over use areas, but these risks are less obvious and less likely. On-going activities as part of the existing program are conducted in accordance with standard operating procedures for the Park, job hazard analyses and with trained personnel. However, the alternatives described in the section below propose changes to the program and will compare the human health and safety risks to visitors associated with the proposed actions.

Environmental Consequences

Methodology

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: the impact is barely detectable, and/or will affect few visitors.

Minor: the impact is slight but detectable, and/or will affect some visitors.

Moderate: the impact is readily apparent and/or will affect many visitors.

Major: the impact is severely adverse or exceptionally beneficial and/or will affect the majority of visitors.

Effects Common to All Alternatives
None of the alternatives propose any changes to visitor use levels as identified in the 1988 Backcountry Management Plan, as amended. Visitor encounter levels (the frequency at which visitors encounter other visitors) would remain the same for all alternatives.

Alternative A - No Action
Direct/Indirect Impacts: Implementing the No Action alternative at this time would result in the continuation of the current backcountry and corridor toilet program, as described in the previous section. Short-term minor adverse impacts to visitor experience would occur with the use of helicopters to periodically empty backcountry and corridor toilets. Helicopter use would likely impact those visitors in the general vicinity of the toilet being emptied and not other visitors outside the immediate vicinity, although impacts to visitors along the helicopter route to and from the site may be impacted as well. The primary impact of helicopter use on visitors is increased noise and is as described below for soundscape. Those toilets that would be maintained using mules would have less direct impacts to visitors since mules would be more typical of the wilderness or corridor setting the visitors are in at the time and thus less noticeable.

Human Health and Safety: Maintaining the current condition of many of the backcountry toilets (Horseshoe Mesa, Monument Creek, Clear Creek, Salt Creek, Horn Creek) and not replacing them with aboveground vault toilets would result in moderate long-term adverse impacts to backcountry visitors. These pit toilets and outhouses are less than sanitary and are difficult to adequately maintain with the current level of use at many of the sites. Not bringing these toilets up to current standards would impact the quality of the visitor experience.

Cumulative Impacts: Combining implementation of the current backcountry and corridor toilet program with past projects and reasonably foreseeable future actions as described in Appendix E would result in long-term beneficial moderate impacts to the quality of the corridor visitor experience. Many of the future actions identified are designed to improve the quality of trails, visitor destinations (Indian Garden Ranger Station Rehabilitation) and visitor facilities (restroom rehabilitations) along the corridor trails. A new restroom is proposed at Three Mile on the Bright Angel Trail, benefiting visitors along the corridor. Keeping the corridor toilet maintenance program in its current status but implementing these other future actions would likely result in positive improvements in the overall visitor experience for those visitors that use the corridor. Backcountry users, or visitors recreating in proposed wilderness areas and not focusing on the corridor, would benefit the most from trail maintenance projects on non-corridor trails such as the Grandview Trail complex. However, many backcountry users typically use the corridor facilities for some portion of their backcountry trip and would benefit from improvements in corridor facilities. Therefore, cumulative impacts to backcountry visitor experience would be long-term and minor. Short-term moderate adverse impacts to visitors along the corridor would result when the proposed projects were being implemented. Visitors would be impacted when trail maintenance work was being done or when construction related activities were being conducted and the quality of their experience would be diminished during that time period. This is expected to be short-term and would last only as long as the projects were being implemented.

Helicopters would be used for the implementation of at least eight of the twelve future projects listed in Appendix E. Because these project sites are all in the inner canyon, transportation options for getting supplies and materials in are limited and helicopter use has been preliminarily identified as the "minimum tool" for implementation of certain aspects of many of these projects. Each project has or would go through a Minimum Requirement Analysis to determine what the minimum tool would be for each project, in accordance with Park wilderness direction. Assuming

that helicopter use would occur for implementation of at least eight of the upcoming projects, in combination with helicopter use as proposed for the continued implementation of the current corridor and backcountry toilet program in the Park, adverse impacts to the quality of the visitor experience is expected. The primary impact to visitor experience is increased noise from helicopters in these areas. Noise impacts are as described below for soundscape. However, because helicopter use would be intermittent and sporadic, spread out over several years of staged implementation of these projects, adverse impacts to the visitor would be long-term but minor. Implementation of mitigation measures to minimize toilet maintenance activities in the busiest visitor use periods would minimize the potential for impacts to visitors in these areas.

Alternative B – Preferred Alternative

Direct/Indirect Impacts: Implementing Alternative B would result in the replacement of existing substandard pit toilets and outhouses with aboveground vaults, would increase the frequency of cyclic maintenance, would reduce the number of backcountry and corridor toilets that would require a helicopter for periodic emptying or removal, and would substantially reduce the total number of estimated flights required for the toilet maintenance program annually, from an estimated 62 flights under the existing program as described in Alternative A to an estimated 24 flights annually under the preferred alternative B. A new toilet would be added in Waldron Basin to replace existing toilets at Santa Maria springs, benefiting day use visitors on the Hermit Trail. These actions would result in moderate long-term beneficial impacts to visitor experience in these areas. Backcountry visitors would have access to toilets that would be more sanitary and clean, and compared to the existing situation, would be disturbed less by helicopter noise during periodic removal or emptying. Minor adverse impacts would result during maintenance periods when mule use on the trails may increase, or when helicopters are used for toilet emptying or removal, but these impacts would be short-term and limited to maintenance periods only.

Human Health and Safety: Backcountry visitors would have access to toilets that would be more sanitary and clean. Safety risks would result with sharing the trails with mules during maintenance trips. Minor adverse impacts would result during maintenance periods when mule use on the trails may increase, or when helicopters are used for toilet emptying or removal, but these impacts would be short-term and limited to maintenance periods only.

Cumulative Impacts: Combining implementation of Alternative B with past projects and reasonably foreseeable future actions as described in Appendix E would result in long-term beneficial moderate impacts to the quality of the corridor visitor experience, as described above for Alternative A. Cumulative impacts would essentially be the same as that described for Alternative A, expect that backcountry toilets would be improved and helicopter use for toilet maintenance would be reduced. Combining these actions under Alternative B with future actions would result in long-term beneficial moderate impacts to the quality of the corridor visitor experience. Backcountry users, or visitors recreating in proposed wilderness areas and not focusing on the corridor, would benefit the most from trail maintenance projects on non-corridor trails such as the Grandview Trail complex and the improvements in toilet facilities in the backcountry as proposed under this alternative. However, backcountry users would typically use the corridor facilities for some portion of their backcountry trip and therefore, cumulative impacts to backcountry visitor experience would be long-term and moderate. Short-term moderate adverse impacts to visitors along the corridor would result when the proposed projects were being implemented. Visitors would be impacted when trail maintenance work was being done or when construction related activities were being conducted and the quality of their experience would be diminished during that time period. This is expected to be short-term and would last only as long as the projects were being implemented.

Alternative C

Direct/Indirect Impacts: Impacts from implementing this alternative would be similar to Alternative B for installation and cyclic maintenance. Toilet empty/removal methods, however, would be different. Like Alternative B, this alternative would replace existing substandard pit toilets and outhouses with aboveground vaults and install a new toilet in Waldron Basin. Benefits to the visitor from this action is as described above for Alternative B. Changes in the frequency of cyclic maintenance is also as described for Alternative B.

Under this alternative all of the backcountry toilets would be periodically emptied with a shovel. For two backcountry sites (Horseshoe Mesa and Waldron Basin) waste would be transferred to portable containers and then backpacked out of the inner canyon to the rim. For Monument Creek, Upper Tapeats, Deer Creek and Hermit Creek, waste would be backpacked out to the river and then transported out of the inner canyon via boat. For Tanner (as in Alternative B) waste would be backpacked to the river, transported to Phantom Ranch via boat and then flown out with routine trips for the wastewater treatment plant. For Clear Creek, waste would be backpacked to Phantom Ranch and then transported by mule to the south rim with regularly scheduled pack trips from Phantom Ranch. Like for Alternative B, mules would be used for periodic emptying at Salt Creek and Horn Creek. All of the corridor toilets, with the exception of those on the North Kaibab Trail, would be periodically emptied using mules. Those on the North Kaibab would be serviced using a helicopter.

Using mules to transport waste would increase the amount of time a maintenance crew would be on site to service the toilet and would likely adversely impact those visitors that may be in the area during the time of servicing. However, this alternative would reduce the number of helicopter flights necessary and would not increase the level of mule use on any of the trails. Minimizing helicopter use would result in minor beneficial impacts to backcountry visitors by reducing noise and visual intrusion in the backcountry.

Human Health and Safety: Corridor toilets (except those on the North Kaibab Trail) would be periodically emptied using mules for transporting out the waste instead of helicopters. This would result in less impact to visitors along the corridor from helicopter noise and visual intrusion, but would substantially increase the potential for mule/hiker conflicts on the corridor trails during the waste removal. Due to the large volume of waste and the load size limit for mules, mule trains would be on the Bright Angel and South Kaibab Trail for extended periods (see Table 4). This has the potential to increase risks to visitors from being bitten, kicked, or stepped on as a result of prolonged presence of livestock in heavily used day use areas. Therefore, although helicopter use under this alternative would be less than that for Alternatives A and B, mule use would increase and this also has the potential for adverse visitor impacts.

Using maintenance crews to backpack waste either to the river or to the rim for the majority of the backcountry toilets would result in substantial increases in the number of park personnel on backcountry trails during the servicing. Due to an estimated waste load limit of 25 pounds (assuming that personal gear, water, food, etc., would also weigh 25 pounds, for a maximum pack weight of 50 pounds per person) it would take approximately 30 backpack loads to empty one full 750 lb aboveground vault. Factoring in this high number of loads with the remoteness of the many of the backcountry sites, would result in increased encounter levels between backcountry visitors and park personnel during empty/removal periods (Table 8). Therefore, while implementation of Alternative C would result in long-term moderate beneficial impacts to visitors by improving backcountry toilet facilities, improving cyclic maintenance methods and substantially reducing the number of helicopter flights for periodic maintenance, it would result in moderate short-term adverse impacts during periodic emptying/removals using backpacks due to

the high number of park personnel on the trails transporting waste for extended periods. River transport of waste following backpack transport also has the potential to negatively impact river users through the potential for a boat flip on the river and unsanitary waste being released into the environment. While human waste is routinely transported on the river for all administrative and commercial river trips annually, increasing the volume of waste transported on the river by adding backcountry toilet waste increases the possibility of a boat flip where waste could be released into the river.

Cumulative Impacts: Combining implementation of Alternative C with past projects and reasonably foreseeable future actions as described in Appendix E would result in long-term beneficial moderate impacts to the quality of the corridor visitor experience, as described above for Alternative A. Cumulative impacts would essentially be the same as that described for Alternative A, except that backcountry toilets would be improved and helicopter use for toilet maintenance would be substantially reduced. Combining these actions under Alternative C with future actions would result in long-term beneficial moderate impacts to the quality of the corridor visitor experience, realizing however that increased mule use on the corridor trails during empty/removal periods would have short-term minor adverse impacts to visitors. Backcountry users, or visitors recreating in proposed wilderness areas and not focusing on the corridor, would benefit the most from trail maintenance projects on non-corridor trails such as the Grandview Trail complex and the improvements in toilet facilities in the backcountry as proposed under this alternative. However, backcountry users would typically use the corridor facilities for some portion of their backcountry trip and therefore, cumulative impacts to backcountry visitor experience would be long-term and moderate. Short-term moderate adverse impacts to visitors along the corridor would result when the proposed projects were being implemented. Visitors would be impacted when trail maintenance work was being done or when construction related activities were being conducted and the quality of their experience would be diminished during that time period. This is expected to be short-term and would last only as long as the projects were being implemented.

Table 8. Alternative C Backpacking Waste Removal Estimates, Grand Canyon National Park.

Site	Removal Method	Distance	Backpack Loads Required	Result
Horseshoe Mesa	Backpack to rim	3 miles	30, 25 lb loads per toilet, for 2 toilets	60 backpack loads on 3 miles of trail to the rim, once per year.
Monument Creek	Backpack to river	2 miles	30, 25 lb loads per toilet, for an estimated 3 toilets	90 backpack loads on 2 miles of trail to the river, once per year. Transport of 2,250 lbs of waste on the river for several days, once per year.
Upper Tapeats	Backpack to river	3 miles	30, 25 lb loads	30 backpack loads on 3 miles of trail to the river, once per year. Transport of 750 lbs of waste on the river for

Site	Removal Method	Distance	Backpack Loads Required	Result
				several days, once per year.
Deer Creek	Backpack to river	1.5 miles	30, 25 lb loads	30 backpack loads on 1.5 miles of trail to the river, once per year. Transport of 750 lbs of waste on the river for several days, once per year.
Clear Creek	Backpack to Phantom Ranch	9 miles	30, 25 lb loads	30 backpack loads on 9 miles of trail to Phantom Ranch, once per year. Transport of waste with regularly scheduled mule trips from Phantom Ranch to south rim.
Hermit Creek	Backpack to river	1.8 miles	60, 25 lb loads	60 backpack loads on 1.8 miles of trail to the river, once per year. Transport of 750 lbs of waste on the river for several days, once per year.
Waldron Basin	Backpack to rim	1.5 miles	30, 25 lb loads	30 backpack loads on 1.5 miles of trail, once per year.
TOTAL 7 SITES	**2 sites hiked to rim, 4 sites hiked to river, 1 site hiked to Phantom Ranch**	**Approximately 35 miles of trail**	**330 backpack loads**	**330 backpack loads on 35 miles of trail every year. River transport of 4,500 lbs of waste every year.**

Conclusions: Implementing Alternative A would generally keep visitor experience as it is currently. Implementation of Alternative B would result in moderate long-term beneficial impacts by replacing existing pit toilets and outhouses with aboveground vaults and reducing the number of helicopter flights required to maintain backcountry toilets. Implementation of Alternative C would also result in long-term moderate beneficial impacts by replacing existing pit toilets and outhouses with aboveground vaults and substantially reducing the number of helicopter flights required to maintain backcountry and corridor toilets. Short-term minor adverse impacts to the

visitor experience may occur during periodic maintenance activities and implementation of future projects under Alternative B. Moderate short-term adverse impacts to visitor experience may occur during backpacking maintenance methods under Alternative C. Moderate beneficial cumulative impacts are expected due to the continued implementation of other projects that are designed to improve Park facilities and consolidate Park functions.

PARK OPERATIONS

Affected Environment

As described in the Backcountry Management Plan (1988), backcountry lands are divided into Use Areas based on established patterns of use and resource management considerations. Each Use Area is further broken out into Management Zones: Corridor, Threshold, Primitive and Wild. The zones provide different recreational opportunities and levels of resource protection, as described in Visitor Experience. In the 1998 Draft Plan, the term "Management Zone" was replaced with the term "Opportunity Class". Table 9 identifies both the management zone and the opportunity class each toilet site occurs in, based on both the 1988 Plan and the 1998 Draft Plan.

Table 9. Use Area and Management Zone excerpts from 1988 Backcountry Management Plan, Grand Canyon National Park.

Toilet Site	Use Area	Management Zone/Opportunity Class	Camping Type
Horseshoe Mesa	Horseshoe Mesa	Threshold	Designated Campsites
Monument Creek	Monument	Threshold	Designated Campsites
Upper Tapeats Creek	Tapeats	Threshold	Designated Campsites
Tanner	Tanner	Primitive	At Large Camping
Deer Creek	Deer Creek	Threshold	Designated Campsites
Clear Creek	Clear Creek	Threshold	At Large Camping
Salt Creek	Monument	Threshold	Designated Campsites
Horn Creek	Monument	Threshold	Designated Campsites
Hermit Creek	Hermit	Threshold	Designated Camping
Waldron Basin	Hermit?	Threshold	?
1 ½ Mile	Bright Angel	Corridor	Designated Campgrounds
Indian Garden	Indian Garden	Corridor	Designated Campgrounds
Cedar Ridge		Corridor	
Tipoff		Corridor	
Cottonwood	Cottonwood	Corridor	Designated Campgrounds
Roaring Springs		Corridor	
Supai Tunnel		Corridor	

These designations are also consistent with the 1998 Draft Plan, with the exception of Deer Creek. This use area was changed from Primitive with at-large camping to Threshold with designated campsites in the 1998 Draft Plan. Use area changes, including some boundary changes at Deer Creek and Tanner, identified in the 1998 Draft Plan were adopted by the Park in 1999, through an evaluation documented in a Categorical Exclusion (CE). This CE was signed in 1999 and is considered an amendment to the 1988 Backcountry Management Plan, reflecting these use area changes.

Backcountry Management Objectives are listed in Appendix F of the 1988 Plan and Management Standards are listed on page 3-32 in the 1998 Draft Plan. As defined in the 1988 Plan, management objectives dictate what kinds of activities can occur without creating impacts beyond a defined level. They detail what the maximum limits of acceptable change may be in any part of the backcountry and they also help to describe differences between the four management zones. Management objectives for the topics most applicable to this project are "Structures Allowed" and "Administrative Aircraft Use". For threshold zones, which include all backcountry toilet sites except Tanner, administrative aircraft use for maintenance of existing facilities or research purposes may be approved by the Superintendent. Structures allowed include toilets and packbars. For primitive zones (Tanner), administrative aircraft use may be approved by the Superintendent and toilets are allowed only as a last resort to contain localized human waste problems. For the corridor zone, administrative aircraft use may be approved by the Superintendent and toilets, packbars, and a variety of other structures such as utilities, campgrounds and ranger stations are allowed (NPS 1988).

Maintenance Program: The current backcountry and corridor toilet maintenance program is as described in Table 3 and Table 6. Helicopters are commonly used to maintain many of the toilets. Cyclic maintenance is dependent on available staff.

Human Health and Safety: There are inherent risks to human health and safety associated with the methods used to maintain existing backcountry and corridor toilets. These include: 1) risks associated with exposing employees to unsanitary conditions while servicing existing substandard toilets and risks associated with working in remote areas of the inner canyon, and 2) risks associated with helicopter use and mules for maintenance. On-going activities as part of the existing program are conducted in accordance with standard operating procedures for the Park, job hazard analyses and with trained personnel. However, the alternatives described in the section below propose changes to the program and will compare the human health and safety risks associated with the proposed actions. Risks associated with backpacking human waste out of the inner canyon are discussed as part of Alternative C.

Environmental Consequences

Methodology

Definitions for levels of impacts to Park operational efficiency are as follows:

Negligible: an action that could change the operations of the Park, but the change would be so small that it would not be of any measurable or perceptible consequence.

Minor: an action that could change the operations of the Park but the change would be slight and localized with few measurable consequences.

Moderate: an action that would result in readily apparent changes to Park operations with measurable consequences.

Major: a severely adverse or exceptionally beneficial change in Park operations.

Alternative A - No Action
Direct/Indirect Impacts

Human Health and Safety*:* Continued implementation of the current backcountry and corridor toilet maintenance program would result in moderate long-term adverse impacts to Park operational efficiency. Without replacement of the existing pit and outhouse toilets in the backcountry, Park employees would continue to be exposed to shoveling out the waste from these facilities and transporting to other containers for transport. This requires several employees on site that are subject to unsanitary conditions. Employees are required to wear personal protective equipment while conducting this work due to the health risks associated with the task. Risks of handling human waste in this manner are inherent and undesirable.

Health and safety risks also play a role in the use of helicopters to periodically maintain existing toilets. Alternative A includes the use of helicopters, up to 62 flights a year (Table 6). This is higher than either of the action alternatives and exposes park employees both in the aircraft and on the ground as support to risks associated with maneuvering a helicopter in remote and rugged locations in the inner canyon. While all employees are trained in standard operating procedures and proper techniques, safety risks exist. The safety risks associated with the use of helicopters to periodically maintain toilets, with short hover times and relatively short flights to and from the toilet occasionally throughout the year, is considered less than those risks associated with mules to transport waste or the use of backpacking. This is primarily due to the fact that employees are exposed to the helicopter for substantially shorter periods of time, when compared to multiple-day trips with mules for an individual site or multiple-day hiking trips to backpack out waste from an individual site (Table 6 and Table 8).

The use of mules to transport waste is proposed for all alternatives to varying degrees. Certain risks are inherent in packing and leading livestock. These risks include being bitten or kicked, being stepped on, pushed down, bucked off or pushed off the trail. Trail conditions during removal periods can often be hazardous due to icy conditions, which constitute an added risk to livestock, handlers, and visitors who must step aside to allow mule traffic to pass on narrow sections of trail. Visitors are at potential risk of being kicked, bitten, or stepped on as a result of prolonged presence of livestock in heavily used day use areas. Employees are at risk from repeated heavy lifting in order to transport compost containers from the toilets to the nearest secure tie off point for mules. While employees would receive safe stock handling training, safety risks exist.

Maintenance Program: Continuing to have substandard toilets that require handling human waste decreases the efficiency of Park operations by increasing the amount of time employees are on site and increases the level of effort for transport out of the canyon, when compared to a self-contained unit that can be more easily removed. Implementation of the current program would also result in continued sporadic cyclic maintenance, dependent on staffing levels and work loads.

Cumulative Impacts: Combining the current toilet maintenance program with past projects and the implementation of foreseeable future actions in the inner canyon, as described in Appendix E

would result in short-term minor adverse impacts to Park operational efficiency due to the implementation of several inner canyon projects over a relatively short period (3 years). This has the potential to strain the maintenance division employees for the time in which the projects would be implemented. However, once projects are complete, Park operational efficiency would likely increase due to the quality of improved trails, restroom facilities and visitor facilities. Rehabilitation of existing facilities would decrease the long-term maintenance needs of these structures and would have a moderate beneficial impact to Park operations in the inner canyon following implementation. Installation of a new composting toilet at Three Mile on the Bright Angel Trail would likely result in a minor increase in workload for the maintenance program.

Alternative B – Preferred Alternative

Direct/Indirect Impacts

Human Health and Safety*:* Replacement of existing substandard pit toilets and outhouses with removable aboveground vaults would substantially reduce the need for shoveling human waste from these toilets and transferring to different containers for transport. While some toilets would still need to be emptied in this manner (shoveling out and transferring to different containers for mule or boat transport), the number of sites maintained in this manner is less than under Alternative A. While helicopter use is also proposed under this alternative, it is estimated that substantially less flights would be necessary to periodically empty the toilets than that occurring as part of the current program (Alternative A). Necessary flights would be reduced from an estimated 62 flights/year to an estimated 24 flights/year, a substantial reduction which would also equate to a reduction in the level of risk to human safety due to helicopter use. Inherent risks associated with helicopter use are as described above under Alternative A.

The use of mules to transport waste is proposed under Alternative B as in Alternative A and safety risks associated with the use of mules is as described under Alternative A. Mule use would increase under Alternative B as compared to that under the current program and therefore inherent risks to human safety for both employees and visitors would likely increase.

Maintenance Program*:* Implementation of Alternative B would result in positive improvements in Park operations. Replacement of existing substandard pit toilets and outhouses with units that are easier to maintain and service will lessen the amount of time it would take for periodic emptying or removal. Having a unit that can be regularly maintained using enzymes and stirring during cyclic maintenance activities should increase the length of time needed between periodic emptying or removal. All of these improvements would result in moderate long-term beneficial improvements in Park operational efficiency. Installation of a new toilet at Waldron Basin would increase the workload of the maintenance crew, but would likely be counteracted by not having to visit and maintain the Santa Maria Springs toilets. Being able to increase the length of time between periodic empty/removals and keeping with monthly cyclic maintenance is also expected to result in fewer helicopter flights per toilet. Cyclic maintenance methods would include stirring and adding enzymes and woodchips to encourage composting functions in the vault. This should allow the waste to breakdown quicker and result in a longer period of time before the unit is full and needs to be emptied.

Using mules as the first option for maintenance of the corridor toilets (with the exception of the ones on the North Kaibab Trail) would require more time than the use of helicopters and would be more labor-intensive. Alternative B would allow for the use of helicopters if staffing and time constraints dictate it is necessary, but mules would always be the first option explored for feasibility. This would result in a more labor-intensive effort per corridor toilet, but would likely be less expensive than the use of helicopters. Due to the large volume of the composting toilets on the corridor trails, the required number of helicopter flights per toilet would be high (see

Alternative C in Table 4). The approximate non-subsidized cost of an hour of quiet technology helicopter is $2700.00 per hour. This is substantially more expensive than using mules for this maintenance. However, a subsidized cost of $858.00 per hour would be used whenever possible. Maintenance of existing facilities is a program typically subsidized by the program. Use of the subsidized helicopter rate would likely result in less cost than the use of mules for these same sites.

Cumulative Impacts: Improving the backcountry and corridor toilet maintenance program through the implementation of Alternative B, combined with past and future projects is expected to result in long-term moderate beneficial impacts to Park operations. Cumulative impacts would be similar to those described for Alternative A, except that beneficial impacts would be more noticeable with this alternative than with Alternative A.

Alternative C

Direct/Indirect Impacts: The direct and indirect impacts to Park operational efficiency would be quite different under Alternative C than under Alternatives A and B. Although there are many similarities between Alternatives B and C, Alternative C proposes to backpack out waste from most of the backcountry toilets (Tables 5, 6, and 8). Other components of this Alternative are the same as for Alternative B so that pit toilets and outhouses would be replaced with aboveground vaults, cyclic maintenance methods would be more structured, mules would be used for periodic emptying at Salt Creek, Horn Creek, and four corridor toilets and helicopters would be used to periodically empty three corridor toilets along the North Kaibab Trail.

Human Health and Safety: The use of mules and helicopters to transport waste involves some safety risk and is as described above for Alternatives A and B. The use of helicopters would substantially decrease under Alternative C, from a total of 64 flights under Alternative B to 24 flights under Alternative C. The use of mules is proposed for one addition site, Indian Garden, under Alternative C and would require an additional 10 separate mule trips per year, when compared to Alternative B.

The use of hikers to backpack out waste is a highly labor intensive and difficult task. As shown in Table 8 and briefly described under Alternative C in the visitor experience section of this Chapter, this would require Park personnel to shovel out waste from these toilets, transfer it to transportable containers and carry it out. This exposes Park personnel to human waste and increases safety risks during handling. This procedure would be done following all NPS standards for this type of task (including proper immunizations and appropriate personal protective equipment such as crampons, sturdy boots and trekking poles) so safety and health risks would be minimized. Nonetheless handling of human waste is undesirable and difficult. It has been estimated that an aboveground vault weighing approximately 750 lbs when full, would require approximately 30 separate backpack loads to be completely emptied. This would require a high number of personnel hiking for long distances from remote toilet locations to either the river or the rim to empty these toilets (Table 8). This level of hiking on Park trails with human waste in backpacks increases the number of Park personnel on the trails, increasing the rates of encounters with visitors, increases the level of use on these trails over current use levels and increases the potential for accidents involving human waste. Hazards to employee health and safety from backpacking these heavy loads up steep trails on a daily basis include heat stress, heat exhaustion, heat stroke and hypothermia. Employees would be exposed to dangers associated with flash floods, the potential for leg injuries associated with persistent strenuous activity, the potential for back injuries associated with lifting and carrying heavy loads, the potential for slips and falls from negotiating icy trails in winter, and the potential for contamination from fecal material coming into contact with employee's food and water supply.

Many of the sites would require backpacking to the river and then transporting human waste down the river for several miles. As shown in Table 8, this would equate to approximately 4,500 lbs of waste being transported downriver every year. This transport would require going through some of the most dangerous rapids on the Colorado River before its destination, increasing the likelihood of unsanitary material being released into the river due to a capsized boat. While this risk may not be high, realizing that waste is transported on the river routinely for commercial and administration river trips annually, it is inherent with river transport and has the potential to increase with the increased frequency and high volume of waste proposed for this removal method under Alternative C.

Maintenance Program: The additional time and labor involved in backpacking waste out of these backcountry toilets and subsequent river transport for some sites would likely negate the perceived higher cost of helicopter use for these sites. The use of hikers to backpack out waste is a highly labor intensive task, as described above and shown in detail in Table 8. As shown in Table 8, it is estimated that the maintenance program under Alternative C would require up to 330 backpack loads on 35 miles of trail every year. Personnel needs for this type of a program on an annual basis would be extreme.

Cumulative Impacts: Improving the backcountry and corridor toilet maintenance program through the implementation of Alternative C, combined with past and future projects is expected to result in long-term moderate beneficial impacts to Park operations. However, long-term moderate adverse impacts are expected if backpacking waste out of the backcountry were the method used over the long-term for backcountry toilet sites, as proposed for Alternative C. Cumulative impacts would be similar to those described for Alternative A, except that adverse impacts would be more noticeable with this alternative than with Alternative A or B.

Conclusions: Park operations would generally remain the same for Alternative A; Moderate long-term beneficial impacts would result from Alternative B due to replacement of substandard toilets with toilets that are easier to maintain and a better-designed cyclic maintenance program; Moderate long-term beneficial impacts would result from Alternative C due to the same reasons as for Alternative B. However, adverse impacts to the program would result from the increased labor, cost and safety risks associated with backpacking and river transport of large volumes of human waste out of the inner canyon.

NATURAL RESOURCES

SPECIAL STATUS SPECIES

Affected Environment

Mexican Spotted Owl – Threatened - Mexican spotted owls nest and roost primarily in closed-canopy forests or rocky canyons. Forests used for roosting and nesting often contain mature or old growth stands with complex structure. These forests are typically uneven-aged, multistoried, and have high canopy closure. Mexican spotted owls do not build nests, but use naturally occurring sites, often in large diameter trees, cliff cavities and abandoned hawk or raven nests. Spotted owl prey mainly on small mammals, particularly arboreal or semi arboreal species, although birds, insects, reptiles and other types of small mammals are taken as well. Prey species composition varies with cover type. Spotted owls are known to occur in canyon habitat of Grand Canyon National Park (GRCA). The primary threats cited for the owl in most Recovery Units

include large-scale catastrophic wildfire and timber harvest. Potential threats cited specifically for the Colorado Plateau Recovery Unit focus more on recreational impacts, road building, and overgrazing.

Spotted Owls occur in Arizona, New Mexico, southern Utah, and portions of Colorado and in Mexico. Mexican spotted owls are typically associated with late seral forests and generally found in habitat that includes mixed conifer and pine-oak forests, riparian madrean woodland, and sandstone canyonlands (U.S. Fish and Wildlife Service 1995). However, Mexican spotted owls have been found in relatively open shrub and woodland vegetation communities in arid canyonland habitat (Willey 1995), contrary to the typical mature forest habitat believed to be the classical norm. MSO's were listed as a threatened species in March 1993 and parts of Grand Canyon National Park were designated as critical habitat in February 2001. A Recovery Plan was published in December 1995. Six Recovery Units were identified in the Plan to allow for specific recovery strategies for each area. GRCA is located with the Colorado Plateau Recovery Unit. The presence of Mexican spotted owls within Grand Canyon National Park was confirmed in 1992 through field surveys of approximately 6,000 acres of suitable habitat on the North and South Rims. Additional Mexican spotted owl surveys occurred in 1994 and 1995 along the South Rim and in 1998 and 1999 along the North Rim, including the project area. These surveys had negative results. Surveys for Mexican spotted owls near the project area were re-initiated in 2001 and are currently ongoing. Although the exact size and extent of the Mexican spotted owl population at Grand Canyon is currently unknown, surveys to date have confirmed 80 responses from MSO's, with the confirmation of 53 individuals, 13 confirmed pairs and the delineation of 40 PACs.

The toilet proposed at Waldron Basin, if installed, would occur within the Hermit PAC. Other toilet locations within 0.5 miles of a PAC include Hermit Creek, Cedar Ridge, Tipoff and Cottonwood.

California Condor – Threatened – Condors are large birds that reach sexual maturity by 5-6 years of age. They are strict scavengers and rely on finding their food visually, often by investigating the activity of ravens, coyotes, eagles, and other scavengers. Without the guidance of their parents, young inexperienced juveniles may also investigate human activity. As young condors learn and mature this human-directed curiosity diminishes. Nesting habitat for California condors includes various types of rock formations such as crevices, overhung ledges, and potholes. Most California condor foraging occurs in open terrain. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass and hours of waiting at a roost or on the ground near a carcass. Roost sites include cliffs and tall trees, including dead trees (snags) (Fish and Wildlife Service 1996). The main reason for the decline of condors was an unsustainable mortality rate of free-flying birds combined with a naturally low reproductive rate. Most deaths in recent years have been related to human activity. Shootings, poisonings, lead poisoning, and powerline collisions are considered the condor's major threats.

The California condor was listed as an endangered species in March 1967 and remains classified as endangered today. In 1996, the U.S. Fish and Wildlife Service established a nonessential, experimental population of California condors in Northern Arizona. In December 1996, the first condors were released in the Vermilion Cliffs area of Coconino County, Arizona, approximately 48 kilometers (30 miles) north of Grand Canyon National Park. Subsequent releases have occurred in May 1997, November 1997, November 1998, and December 1999 in the same vicinity and Hurricane Cliff area, which is about 60 miles west of Vermilion Cliffs. By declaring the population "experimental, nonessential", the U.S. Fish and Wildlife Service can treat this population as "threatened" and develop regulations for management of the population that are

less restrictive than mandatory prohibitions covering endangered species. This facilitates efforts to return the condor to the wild by providing increased opportunities to minimize conflict between the management of the condors with other activities. Within Grand Canyon National Park, the condor has the full protection of a threatened species (NPS 1991).

All of the condors in the experimental, nonessential population in Northern Arizona are fitted with radios allowing field biologists to monitor their movements. Condors have been observed as far west as the Virgin Mountains near Mesquite, Nevada; south to the San Francisco Peaks outside of Flagstaff, Arizona; north to Zion and Bryce Canyon National Parks and beyond to Minersville, Utah; and east to Mesa Verde, Colorado and the Four Corners region (Peregrine Fund 2000). Monitoring data indicate condors are using habitat throughout Grand Canyon National Park, with concentration areas in Marble Canyon, Desert View to Hermits Rest on the South Rim and Bright Angel Point on the North Rim.

There are currently no active or previously successful condor nests in the Park. However, condors are known to frequent the inner canyon and have the potential to occur at any one of the backcountry or corridor toilet locations.

Grand Canyon Catchfly – Species of Concern – This perennial herb occurs in pinyon-juniper woodlands in loamy soils between 5,600 and 6,800 feet elevation. It is a member of the Caryophyllaceae family and is endemic to Grand Canyon National Park in Coconino County (Brian 2000). Locations within the Park include Bright Angel Trail near Garden Creek, the vicinity of Hermits Rest on the South Rim, upper Waldron Basin in upper Hermit Canyon, and along New Hance Trail in Red Canyon. Very little is known about the biology of this plant. It flowers late April to May and fruiting occurs May to June. It is typically found on north-facing slopes (AGFD 2000).

The Waldron Basin toilet, if installed, would occur within potential habitat for this species.

Environmental Consequences

The thresholds of change for the intensity of an impact to wildlife and plant populations are defined as follows:

Negligible: an action that could result in a change to a population or individuals of a species, or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence.

Minor: an action that could result in a change to a population or individuals of a species or designated critical habitat. The change could be measurable but small and localized and of little consequence.

Moderate: an action that would result in some change to a population or individuals of a species or designated critical habitat. The change would be measurable and of consequence.

Major: an action that would result in a noticeable change to a population or individuals of a species or resource or designated critical habitat.

Alternative A - No Action

Direct/Indirect Impacts. Impacts to MSO's would be negligible to minor as a result of implementing the No Action alternative. With the exception of the Waldron Basin toilet, the toilets are already in place and any site or vegetation disturbance would be minimal. MSO Habitat components would not be disturbed. Maintenance activities associated with toilets within a 0.5 miles of a known PAC have the potential to impact MSO's through increased noise. The only project component that would result in substantial increases in ambient noise levels is the use of helicopters to periodically empty the toilets. However, because these flights would be restricted to outside the MSO breeding season (March 1 – August 31), the potential for noise-related impacts to MSO's is minimized. Therefore, impacts to MSO's from implementing Alternative A would be negligible to minor.

Impacts to condors would be negligible to minor as a result of implementing the No Action alternative. With the exception of the Waldron Basin toilet, the toilets are already in place and any site or vegetation disturbance would be minimal. No impacts to nearby cliffs would occur and condor habitat components would not be disturbed. If future nesting attempts are documented in the canyon, appropriate protective measures would be taken if any activities associated with the maintenance of backcountry and corridor toilets occur near nest sites, as described in the mitigation measures section in Chapter 2. If condors frequent the toilet sites during installation or periodic maintenance activities, additional measures would apply to these activities to minimize the potential for harm to the birds, as also described in Chapter 2. Therefore, impacts to condors from implementing Alternative A would be negligible to minor.

Impacts to Grand Canyon catchfly would be negligible for the corridor toilet sites along Bright Angel Trail. Because implementation of project components under this alternative would not require site or vegetation disturbance and would occur on existing disturbed sites and trails, impacts to this plant along the Bright Angel Trail is not expected.

Cumulative Impacts: Combining the continued backcountry and corridor maintenance program with other foreseeable future actions in the inner canyon would result in the potential for impacts to MSO's, condors and Grand Canyon catchfly. However, each of the future or on-going projects listed has been and/or will be evaluated specifically for direct or indirect impacts to MSO's, condors and Grand Canyon catchfly, where applicable, and these impacts mitigated so as to avoid adverse impacts to these species. Restrictions on helicopter flights for implementation of the Grandview East, South Kaibab and North Kaibab trail maintenance projects to include a specified flight corridor that would be well away from known MSO PACs is in place for those projects. Restrictions on the use of construction equipment within 0.5 miles of a known PAC is in place for trail maintenance projects as listed in Appendix G. In addition, several future projects (Three Mile Restroom, Bright Angel Campground Restroom Rehabilitation, Indian Garden Restroom Rehabilitation, Phantom Ranch Ranger Station Rehabilitation, Phantom Ranch Restroom Rehabilitation and the Rehab of the Black and Silver Bridges) were included in a Batch Consultation with the Fish and Wildlife Service in order to more adequately analyze the impact of multiple construction-related projects in the Park on MSO, condors, sentry milk vetch and bald eagles (NPS 2002). Conservation measures were developed as part of this batch consultation and will apply to all of these projects. Grand Canyon catchfly has a very restricted range. The only other future project that has the potential to impact this species is the maintenance work planned for the Bright Angel trail. However, generally maintenance activities focus on the existing trail tread and would only in very limited circumstances need to impact areas outside of the trail. Therefore, implementation of Alternative A in combination with past and future projects may result in cumulative impacts to MSO, condors and Grand Canyon catchfly but these impacts are expected to be minor.

Impairment: Direct, indirect, and cumulative impacts to MSO's, condors and Grand Canyon catchfly would be negligible to minor as a result of implementing the no action alternative. These

impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wildlife resources or Park values.

Alternative B – Preferred Alternative

Direct/Indirect Impacts: Impacts to MSO's from implementation of Alternative B are as described for Alternative A, with the exception of the potential addition of the Waldron Basin toilet under this alternative. The only toilet location within an occupied PAC is Waldron Basin. Waldron Basin is also an area designated as a Research Natural Area. The Park is unsure at this time if this toilet is necessary to address the level of visitor use in this area. Visitor use monitoring would be initiated prior to installation of a toilet in this area. Mitigation measures specific to the Waldron Basin toilet (Chapter 2) would be implemented prior to installation of this toilet including a detailed analysis of the potential for impacts to this PAC and consultation with the Fish and Wildlife Service prior to installation. The use of helicopters is a component of this alternative as well. However, because these flights would be restricted to outside the MSO breeding season (March 1 – August 31), the potential for noise-related impacts to MSO's is minimized. Therefore, impacts to MSO's from implementing Alternative B would be minor.

Impacts to condors from implementation of Alternative B are as described for Alternative A. Adherence to condor mitigation measures (Chapter 2) would minimize the potential for adverse effects. Therefore, impacts to condors from implementing Alternative B would be negligible to minor.

Impacts to Grand Canyon catchfly from implementation of Alternative B are as described for Alternative A, with the exception of the potential addition of the Waldron Basin toilet under this alternative. This is the only toilet location with the potential to disturb habitat for this species. The Park is unsure at this time if this toilet is necessary to address the level of visitor use in this area. Visitor use monitoring would be initiated prior to installation of a toilet in this area. Mitigation measures specific to the Waldron Basin toilet (Chapter 2) would be implemented prior to installation of this toilet including a Grand Canyon catchfly survey and consultation with the Park's Vegetation Program Manager prior to installation. Therefore, impacts to Grand Canyon catchfly from implementing Alternative B would be minor.

Cumulative Impacts: Due to the similarity in Alternative A, B and C project components that have the potential to impact special status species, cumulative impacts from implementation of either one of these alternatives is considered the same. As stated above for Alternative A, implementation of Alternative B in combination with past and future projects may result in cumulative impacts to MSO, condors and Grand Canyon catchfly but these impacts are expected to be minor.

Impairment: Direct, indirect, and cumulative impacts to MSO's, condors and Grand Canyon catchfly would be minor as a result of implementing Alternative B. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wildlife resources or Park values.

Alternative C

Direct/Indirect Impacts: Impacts to MSO's from implementation of Alternative C are similar to those previously described for Alternatives A and B, with the exception that helicopter flights would be substantially reduced under this alternative. Backpacking out waste and the use of river transport and/or mules is the focus of this alternative for periodic toilet empty/removals. Because helicopter flights are the one project component with the potential for the most impact to MSO's, reducing their use also reduces the likelihood of disturbance to MSO's. Helicopter use is not avoided with this alternative however, and would still be a potential option for 9 sites. However, because these flights would be restricted to outside the MSO breeding season (March 1 – August 31), the potential for noise-related impacts to MSO's is minimized. Therefore, impacts to MSO's from implementing Alternative C would be negligible to minor.

Impacts to condors from implementation of Alternative C are as described above for Alternatives A and B. Adherence to condor mitigation measures (Chapter 2) would minimize the potential for adverse effects. Therefore, impacts to condors from implementing Alternative C would be negligible to minor.

Impacts to Grand Canyon catchfly from implementation of Alternative C are as described for Alternative B. Mitigation measures specific to the Waldron Basin toilet (Chapter 2) would be implemented prior to installation of this toilet including a Grand Canyon catchfly survey and consultation with the Park's Vegetation Program Manager prior to installation. Therefore, impacts to Grand Canyon catchfly from implementing Alternative C would be minor.

Cumulative Impacts: Due to the similarity in Alternative A, B and C project components that have the potential to impact special status species, cumulative impacts from implementation of either one of these alternatives is considered the same. As stated above for Alternative A, implementation of Alternative C in combination with past and future projects may result in cumulative impacts to MSO, condors and Grand Canyon catchfly but these impacts are expected to be minor.

Impairment: Direct, indirect, and cumulative impacts to MSO's, condors and Grand Canyon catchfly would be minor as a result of implementing Alternative C. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wildlife resources or Park values.

Conclusions: Alternative A would result in negligible to minor impacts to MSO, condor and Grand Canyon catchfly, primarily through the implementation of mitigation measures specific to various project components with the potential for impacts to these species. Alternative B has the potential to result in a moderate adverse impact to MSO and a minor adverse impact to Grand Canyon catchfly due to the installation of the Waldron Basin toilet. Impacts to condors would be negligible for Alternatives B and C. Alternative C goes the furthest in minimizing helicopter flights and therefore, minimizes the likelihood of noise disturbance to MSO's. Cumulative impacts are expected but would be minor for MSO and Grand Canyon catchfly and minor to moderate for condors.

SOUNDSCAPE

Affected Environment

Grand Canyon National Park continues to be the focus of attention regarding the effects of aircraft overflights on natural quiet and visitor experience. Aircraft overflights are strictly regulated in the Park and administrative use of aircraft in the Park is subject to stringent flight approval processes in order to minimize the potential for impacts to natural quiet (soundscape) and visitor experience in the Park (Ebersole pers. comm. 2002) Extensive noise measurements have been gathered in the Park. A close approximation of natural quiet is the measured natural ambient sound condition, with all sounds of human origin excluded. The natural ambient data show that Grand Canyon is generally a very quiet place (NPS 1995).

The decibel (dB) is a standard unit of measurement for sound. Because sounds of different frequencies may or may not be perceived as noise by humans, sound measurements are weighted for sensitivity in particular frequencies and are expressed in A-weighted units (dBA). Typical ambient levels in Grand Canyon Village are in the 50 to 60 dBA range [as a point of reference, a typical conversation between two people would be about 60 dBA while busy street traffic would be about 70 dBA (Tilley 1974 and NPS 1995)]. Typical ambient levels in the Park's more remote areas with less vegetation and human influences to contribute to noise can approach 10 dBA, which is at the threshold of human hearing. Table 9 displays several typical ambient noise levels measured throughout the Park.

In general, threshold management zones likely have higher ambient sound levels than primitive or wild zones. Threshold zones would generally have higher than average ambient sound levels in the most popular areas during peak-season and are likely at the higher end of the range of ambient levels measured in the inner canyon, as shown in Table 9. A site-specific sound analysis has not been conducted at each of the backcountry toilet locations. For purposes of this analysis it is assumed that backcountry toilet locations in threshold management zones and the one primitive zone (Tanner toilet) have ambient sound levels during peak season of about 25 - 30 dBA. Toilet locations near the river (Tanner, Deer Creek and Upper Tapeats) are likely higher and are assumed to be approximately 35 - 40 dBA, similar to the sound level measured at Phantom Ranch overlook.

The proposed use of helicopters to install and periodically maintain the backcountry toilets in the Park is the only project component that is expected to result in increased noise in proposed wilderness areas. The typical sound level for a helicopter taking off is estimated at 88 dBA at 200 feet, and a helicopter landing is estimated at 80 dBA at 200 feet. The Park is committed to the use of a quiet technology helicopter for all of its administrative uses. This MD-900 aircraft does not have a tail rotor, which substantially minimizes the noise generated when in flight, compared to other traditional helicopters. Although the noise generated during take off and landing would be similar to other helicopters and is estimated between 80 – 90 dBA, as stated above, the perceived noise while in flight would be approximately 10 dBA less than a traditional helicopter.

This quiet technology helicopter would be used for all flights necessary for toilet maintenance, unless unforeseen circumstances exist (aircraft in for maintenance, etc.) and has been in use in the Park for over five years.

Table 10. Ambient Sound Levels at selected areas of Grand Canyon National Park (taken from NPS 1995).

Location	Ambient Sound Level (dBA)	Range of Ambient Levels (dBA)
Grand Canyon Village	50-60	NA
Desert View Watchtower Area	34-48	29-58
Phantom Ranch Overlook (Bright Angel Creek clearly audible)	41	39-44
Inner Canyon Locations away from the sound of moving water	22-28	12-38

Aircraft Overflights: The park is committed to substantially restoring the natural quiet and visitor experience of the park, in accordance with Public Law 100-91 (August 1987). This includes minimizing the impacts of all types of aircraft overflights; i.e., commercial air tour, general aviation, military and airline operations. There are presently between 18 and 20 commercial air tour operators that fly over Grand Canyon National Park. These companies are strictly regulated, including but not limited to adhering to minimum altitudes and a maximum number of air tour flights per year. This is a very sensitive issue and the park is committed to the continued implementation of current and future regulations. Discussions and evaluations with multiple affected parties are currently on-going.

Environmental Consequences

Methodology

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: the noise impact to a resource or value is barely detectable, and/or will affect few visitors.

Minor: the noise impact to a resource or value is slight but detectable, and/or will affect some visitors.

Moderate: the noise impact to a resource or value is readily apparent and/or will affect many visitors.

Major: the noise impact to a resource or value is severely adverse or exceptionally beneficial and/or will affect the majority of visitors.

Assumptions Regarding Aircraft Overflights: The aircraft overflight issue should not be ignored when evaluating the cumulative impact these overflights might have on soundscape when combined with administrative uses of aircraft in the Park. However, administrative flights in proposed wilderness would generally occur below the minimum altitude set for commercial operators, they are only occasional and sporadic, and are used when no other method is deemed feasible. The regulations currently placed on commercial air tour companies have still not allowed the park to meet the mandated goal of substantial restoration of natural quiet. It is assumed that aircraft overflights currently result in moderate to major impacts to the park's soundscape. Once substantial restoration is achieved, however, it is assumed that aircraft overflights will result in minor to moderate impacts. Evaluation of the impact of occasional

individual administrative aircraft use in the park will assume that aircraft overflights are already contributing moderate to major impacts to the park's soundscape. Cumulative impact analysis for each of the alternatives below will focus on the potential for additional impacts from implementation of the alternative in addition to the other administrative actions listed in Appendix G, recognizing that moderate to major impacts are on-going as a result of aircraft overflights.

Assumptions Regarding Emergency Aircraft Use: Park aircraft operate in the inner canyon when necessary for a variety of administrative uses; e.g., medical evacuations, search and rescue, wildland fire suppression, law enforcement, utility outages, etc. This use, by its nature, is sporadic and unpredictable. For this analysis, it is assumed that these operations would occasionally occur in the inner canyon and that they would result in short-term minor adverse impacts to soundscape and visitor experience in the backcountry.

Alternative A – No Action

Direct/Indirect Impacts: Continued implementation of the backcountry and corridor toilet maintenance program would require the administrative use of helicopters to periodically maintain most of the sites. The use of helicopters is the only project component of any of the alternatives with the potential to create substantial increases in ambient noise. Proposed helicopter use is highest for Alternative A than it is for Alternatives B or C. Ambient noise levels at proposed backcountry toilet sites is estimated to range from 30 – 40 dB. If a helicopter were to land near one of these sites and then take off after the toilet was emptied, approximately 80 dB of noise would be generated. This is over double the ambient noise level and would readily be perceived as intense noise by visitors in these areas. However, helicopter use would occur only during the off-peak season (November – March) to minimize the potential for impact to most visitors. When helicopters are used to access the backcountry or corridor they would not operate between the hours of 5 PM and 9 AM to further minimize impacts to visitors. The Park would use the quiet technology helicopter when available to further minimize excessive noise generation and disturbance to visitors when in flight. Helicopters would be used for most sites and most sites would require multiple trips. However, when factoring in this use over the course of year, flights would be occasional and infrequent. Flights would be concentrated in the off-peak season, resulting in most visitors encountering helicopter noise only infrequently. Therefore the use of helicopters for this alternative (assuming adherence to mitigation measures as listed here and in Chapter 2) would result in moderate short-term impacts to soundscape. Looking at the long-term, this occasional administrative use is expected to result in only minor impacts to soundscape within the Park.

Cumulative Impacts: Helicopter use in the inner canyon for Alternative A combined with on-going aircraft overflights, on-going and future emergency aircraft use, and other projects as listed in Appendix G results in a higher potential for noise impacts. Approximately eight of the twelve planned projects listed in Appendix G would require the use of a helicopter to transport in materials or supplies. Trail maintenance projects would likely require helicopter use occasionally every year, as routine maintenance needs continue annually. Each of the projects likely to occur in the next several years in the inner canyon are subject to a Minimum Requirement Analysis where a detailed analysis is conducted to determine if helicopters are indeed the minimum tool required to perform the necessary task. Assuming these MRAs are conducted and that helicopter use is deemed the minimum tool according to approved NPS standards for evaluation, application of mitigation measures, such as timing constraints or seasonal constraints or use of the quiet technology helicopter would be used to minimize impacts to soundscape and to visitor experience in proposed wilderness. Although helicopters would be used for multiple administrative uses as part of the implementation of this Alternative with other future projects, the fact that this use

would be sporadic and occasional minimizes the likelihood of adverse impacts to the soundscape of the inner canyon. Implementation of Alternative A combined with past, on-going and future projects in the inner canyon would result in moderate short-term impacts to soundscape. Moderate impacts would be likely during the helicopter use but would be of short duration. When factored into any one year, the noise generated from administrative helicopter use in the inner canyon would be considered minor over the long-term and would not result in a cumulative impact that is greater than the moderate impacts currently occurring as a result of aircraft overflights.

Impairment: Direct, indirect, and cumulative impacts to soundscape would be minor to moderate as a result of implementing the no action alternative. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's wildlife resources or Park values.

Alternative B – Preferred Alternative

Direct/Indirect Impacts: Helicopter use is also proposed under this alternative, but would result in fewer flights than Alternative A, due to the fact that the existing backcountry pit toilets and outhouses would be replaced with aboveground vaults that are more easily maintained and transported. Improvements in cyclic maintenance methods under this alternative would also aid in minimizing the number of flights required per toilet per year by enhancing composting functions. As shown in Table 6, Alternative B would result in the reduction in the number of helicopter flights necessary for toilet maintenance from 62 flights/year to 24 flights/year in the backcountry (a 61% reduction) and from 57 flights to 38 flights/year in the corridor (a 33% reduction). Mules would be used when possible on the corridor toilets on the South Kaibab and at 1 ½ mile, versus helicopters under Alternative A. Helicopters would be used for many sites and some sites would require multiple trips. However, when factoring in this use over the course of year, flights would be occasional and infrequent. Flights would be concentrated in the off-peak season, when fewer backcountry and frontcountry visitors are present, resulting in most visitors only infrequently encountering helicopter noise. Therefore the use of helicopters for this alternative (assuming adherence to mitigation measures as listed under Alternative A and in Chapter 2) would result in minor to moderate short-term local impacts to the soundscape. Looking at the long-term, this occasional administrative use is expected to result in only minor and localized impacts to the soundscape within the park.

Cumulative Impacts: Helicopter use in the inner canyon for Alternative B combined with on-going aircraft overflights, on-going and future emergency aircraft use, and other projects as listed in Appendix G results in a higher potential for noise impacts. Although fewer administrative helicopter flights would occur as a result of implementation of Alternative B than Alternative A, when combined with other on-going and future uses, Alternative B is expected to result in similar impacts. Therefore, implementation of Alternative B combined with past, on-going and future projects in the inner canyon would result in minor to moderate short-term impacts to soundscape. Minor to moderate impacts would be likely during the helicopter use but would be of short duration. When factored into any one year, the noise generated from administrative helicopter use in the inner canyon would be considered minor over the long-term and would not result in a cumulative impact that is greater than the impacts currently occurring as a result of other aircraft overflights.

Impairment: Direct, indirect, and cumulative impacts to soundscape would be minor to moderate as a result of implementing Alternative B. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's soundscape resources or Park values.

Alternative C -Backpacking

Direct/Indirect Impacts: Helicopter use is also proposed under this alternative, but would result in substantially fewer flights than either Alternative A or Alternative B. Like Alternative B, existing backcountry pit toilets and outhouses would be replaced with aboveground vaults that are more easily maintained and transported. Improvements in cyclic maintenance methods under this alternative would also aid in minimizing the number of flights required per toilet per year by enhancing composting functions. Alternative C goes further than Alternative B in utilizing non-mechanical methods for waste removal. Mules would be used for all of the corridor toilets except those on the North Kaibab and would also be used to empty Horn Creek and Salt Creek. Backpacks would be used for all other backcountry sites. This would eliminate the use of helicopter flights in the backcountry and would reduce the number of flights required for the corridor from an estimated 57 flights/year currently to 22 flights/year (a 61% reduction). When factoring in this use over the course of year, flights would be occasional and infrequent. Flights would be concentrated in the off-peak season, resulting in most visitors encountering helicopter noise only infrequently. Therefore the use of helicopters for this alternative (assuming adherence to mitigation measures as listed under Alternative A and in Chapter 2) would result in minor short-term impacts to soundscape. Looking at the long-term, this occasional administrative use is expected to result in only minor impacts to soundscape within the Park.

Cumulative Impacts: Helicopter use in the inner canyon for Alternative C combined with on-going aircraft overflights, on-going and future emergency aircraft use, and other projects as listed in Appendix G results in a higher potential for noise impacts. Although fewer administrative helicopter flights would occur as a result of implementation of Alternative C than either Alternative A or B, when combined with other on-going and future uses, is expected to result in similar impacts. Therefore, implementation of Alternative C combined with past, on-going and future projects in the inner canyon would result in minor to moderate short-term impacts to soundscape. Minor to moderate impacts would be likely during the helicopter use but would be of short duration. When factored into any one year, the noise generated from administrative helicopter use in the inner canyon would be considered minor over the long-term and would not result in a cumulative impact that is greater than the moderate impacts currently occurring as a result of aircraft overflights.

Impairment: Direct, indirect, and cumulative impacts to soundscape would be minor to moderate as a result of implementing Alternative C. These impacts would not result in impairment. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park; or (3) identified as a goal in the Park's general management plan or other relevant National Park Service planning documents, there would be no impairment of Grand Canyon National Park's soundscape resources or Park values.

Conclusions: Moderate and localized short-term impacts to soundscape would result from Alternative A due to occasional helicopter use. Minor to moderate localized short-term impacts would result from helicopter use under Alternative B, and minor, localized short-term impacts would result from helicopter use under Alternative C. As stated previously, it is assumed that all aircraft overflights currently result in moderate to major impacts to the park's soundscape. Once substantial restoration of natural quiet is achieved, however, it is assumed that aircraft overflights will result in minor to moderate impacts. In the total context of aircraft-produced noise, the additional impacts caused by Alternatives A, B or C is considered negligible.

CULTURAL RESOURCES

Affected Environment

Cultural History Overview

Prehistory

Recent archaeological evidence has placed the earliest known cultural activity in the Grand Canyon area to about 8500 BC. This coincides with the Late Paleo-Indian period (ca. 9000-7000 BC), characterized by small groups of nomadic hunters who subsisted primarily on large Pleistocene mammals ("mega-fauna"). The Archaic period (ca. 7000-500 BC) followed with highly mobile groups of hunters and gatherers dispersed over wide geographic areas. Archaic period sites found throughout the Canyon typically consist of lithic scatters, camp sites, chip stone reduction areas, limited activity areas, rock art panels, caves, and rock shelters (NPS 2001:17).

Between ca. 500 BC and AD 1540, ancestral Puebloan people settled along the inner Canyon and on the North and South Rims. Cultural remains identified from the Basketmaker II & III periods (while rare in the Grand Canyon area) are indicative of semi-mobile hunting and gathering subsistence strategies. Hearths, limited activity areas, and pithouses with dispersed artifact scatters have been identified from these periods. Archaeological evidence indicates the emergence of a more sedentary and agriculturally centered culture during the later Pueblo I period (ca. AD 800-1000) and Pueblo II period (ca. AD 1000-1150). Among the archaeological resources identified with these later periods are pithouses, aboveground masonry structures (for habitation and grain storage), kivas, and agricultural features (terraces, garden plots, and check dams). Most of the Puebloan people abandoned the canyon sometime after AD 1170, with only remnant populations remaining (NPS 2001:17).

Cohonina people were also present in the Grand Canyon at approximately the same time as their Puebloan neighbors. Although archaeological information regarding Cohonina activities in the Canyon is currently limited, mounting evidence suggests that they possessed a complex culture that involved foraging in the vicinity of the Canyon during the summer season. They wintered near Mt. Sitgreaves, where identified sites include pithouses, masonry room blocks, walled compounds, interior hearths, and storage areas (NPS 2001:17).

Historic Period.

The Havasupai and Hualapai were among the groups occupying the canyon during protohistoric and historic times (the period between approximately A.D. 1540 and 1950). Up until the late nineteenth century, the Havasupai traditionally spent their winters on the plateau of the South Rim, relocating below the rim to Cataract (Havasu) Canyon during the spring and summer months to grow crops. Historical accounts document ancestral Navajo interactions with the Havasupai during the 1600s. By the mid nineteenth century, the Navajo made extensive use of

Canyon resources for subsistence and religious purposes, and continued to graze sheep, goats, and horses in the vicinity into the 1930s and 1940s. The Hopi, Southern Paiute, and Zuni have also at various times either occupied the Grand Canyon, procured and utilized canyon resources, and/or traded with the Havasupai and other groups (NPS 2001:17).

The first historic Euro-American contact with the Grand Canyon and its indigenous Puebloan people began between 1540 and 1542 with the Spanish expedition led by Francisco Vásquez de Coronado. The Canyon was initially considered an impassable barrier, and the Spaniards did not revisit it for another 200 years. During the nineteenth century, trappers and United States surveyors and military expeditions passed through the area. Some sheep ranching and mining took place in the latter part of the century. However, more economically viable ranching, tourism, and lumbering operations emerged around the beginning of the twentieth century, facilitated by completion of rail transportation to the South Rim in 1901. Environmental degradation from overgrazing and lumbering led to the establishment of the Grand Canyon Forest Reserve in 1893. Efforts to provide further protection eventually resulted in the establishment of Grand Canyon National Park in 1919 (NPS 2001:17-18).

National Historic Districts

Horseshoe Mesa, which currently has two toilet locations, is within the Grandview Mine Historic Mining District that is approximately 91 acres in size. This mining district consists of the ruins of a mining complex that includes such features as a stone house, mine shafts, and machinery. Begun in 1890 by Peter D. Berry, the mine produced limited amounts of copper that Berry packed out by mule on a trail that he constructed to the South Rim (the Grandview Trail). Berry sold his mine in 1901 and by 1907 mining operations had ceased. There are many such examples of efforts to mine the Grand Canyon area. Generally speaking, mining was largely unsuccessful due to the difficulty of transporting materials out of the canyon and to processing plants (GMP 1995 and USDI no date). The two existing toilets at Horseshoe Mesa are both outside of the historic district boundary, but one is adjacent to the district.

Two other National Register properties that exist in the inner canyon include the Cross Canyon Corridor Historic District and the Trans-Canyon Telephone Line Historic District. The Cross Canyon Corridor District includes 44 buildings and structures and the Bright Angel, South Kaibab, North Kaibab and connecting river trails. Some of the principal structures in the district include four trailside rock shelters along the Bright Angel trail and the Phantom Ranch complex at the bottom of Grand Canyon.

The Transcanyon Telephone Line District is about 18 miles long and roughly parallels the Bright Angel and North Kaibab Trails from the South Rim to Roaring Springs, with a spur line running 2 miles up the South Kaibab Trail. The line consists of almost 600 metal poles strung with copper-weld wire. The poles were installed in 1935, with some modifications made in 1938-1939 to provide the Park Service with its own telephone system.

Cultural Landscape Resources

The Cultural Landscapes Inventory Professional Procedures Guide prepared by the NPS defines cultural landscapes as:

> . . . settings that human beings have created in the natural world. They reveal fundamental ties between people and land—ties based on our need to grow food, give form to our settlements, meet requirements for recreation, and find suitable places to bury our dead. Cultural landscapes are intertwined patterns of things both natural and constructed—plants and fences, watercourses, and buildings. They range from formal gardens to cattle ranches,

from cemeteries and pilgrimage routes to village squares. They are special places—expressions of human manipulation and adaptation of the land (Page 2001:1).

Six American Indian groups, represented by nine separate tribal governments, have ancestral ties to the Grand Canyon. Some American Indians consider the Colorado River, the canyon, specific resources, and the larger landscapes in which they occur to be sacred. These larger landscapes include sites, locations and resources that are of traditional significance to all tribes in some cases, and to some tribes in others. These traditional cultural properties include historic properties that are potentially eligible for listing on the National Register of Historic Places because of their association with cultural practices and their importance in maintaining the cultural identity of ongoing American Indian communities (GMP 1995). Consultations with those tribes interested in projects occurring in the inner canyon were conducted for this project during the scoping period in October 2001 (see Chapter 1 and Chapter 5). Letters were received from three of these tribes (Hopi, Navajo and Zuni). No specific references to traditional cultural properties were identified in the vicinity of the project areas.

Ethnographic Resources

Ethnographic resources are defined by the NPS as any "site, structure, object, landscape, or natural resource feature assigned traditional, legendary, subsistence, or other significance in the cultural system of a group traditionally associated with it" (Cultural Resource Management Guidelines [DO-28:191]). The lands of Grand Canyon National Park are traditionally affiliated with nine American Indian groups: Havasupai, Hopi, Hualapai, Kaibab Band of Paiute Indians, Navajo, Paiute Indian Tribe of Utah, White Mountain Apache, San Juan Southern Paiute, and Pueblo of Zuni.

The Grand Canyon has long been of importance to native cultures and figures prominently in the origin/religious beliefs and ceremonial practices of many groups. For example, traditional Hopi and Zuni beliefs hold the Grand Canyon as the sacred place from which their ancestors emerged to the present world (NPS 2001). Although ethnographic resources significant to Native Americans may be present in the inner canyon, no ethnographic resources are known to exist within the vicinity of the project sites.

Copies of this EA will be forwarded to each affiliated tribe for review and comment. If the tribes subsequently identify the presence of additional ethnographic resources within the project areas, appropriate mitigation measures would be undertaken in consultation with the tribes. The location of any ethnographic sites would not be made public.

Archaeological Resources

Each of the backcountry toilet sites have been recently surveyed for archeological resources. The proposed relocation of the Monument toilet was in part due to the presence of an archeological site at the current location and the desire to remove the toilet from the vicinity of this site. The new location proposed has been surveyed and no archeological sites have been found. The proposed location for the Waldron Basin toilet has also been surveyed and no archeological sites have been found.

Environmental Consequences

In this environmental assessment/assessment of effect, impacts to cultural resources (archeological resources, historic structures, the cultural landscape, and ethnographic resources) are described in terms of type, context, duration, and intensity, as described above. These impact analyses are intended, however, to comply with the requirements of both NEPA and §106 of the NHPA. In accordance with the Advisory Council on Historic Preservation's regulations

implementing §106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must also be made for affected cultural resources that are eligible for the National Register. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register, e.g., diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the preferred alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

CEQ regulations and the National Park Service's Conservation Planning, Environmental Impact Analysis and Decision-making (Director's Order #12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by §106 is similarly reduced. Although adverse effects under §106 may be mitigated, the effect remains adverse.

A §106 summary is included in the impact analysis sections for cultural resources under the action alternatives. The §106 Summary is intended to meet the requirements of §106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based upon the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

The definitions for levels of impacts to cultural resources are as follows:

- **Negligible** - impact is barely measurable and has no perceptible consequences, either adverse or beneficial, to archaeological resources. For National Register properties, there is no change in any character-defining features of the resource. For purposes of §106, the determination of effect would be no adverse effect.

- **Minor** Adverse – disturbance of the site(s) is confined to a small area with little, if any, loss of important information. For purposes of §106, the determination of effect would be no adverse effect. Beneficial – a site is preserved in its natural state. For purposes of §106, the determination of effect would be no adverse effect.

- **Moderate** Adverse – disturbance of the site(s) results in a substantial loss of important information. For National Register properties, the effect would not be harmful to those characteristics that quality the property for inclusion on the National Register. For purposes of Section 106, the determination of effect would be adverse effect. Beneficial – Stabilization of the site(s). For purposes of §106, the determination of effect would be no adverse effect.

- **Major** Adverse – The impact is severely adverse or exceptionally beneficial; For National Register properties, the effect would be harmful to character-defining features of the National Register site. Disturbance of the site(s) is substantial and results in the loss of most or all of the site and its potential to yield important information. For purposes of §106, the determination of effect would be adverse effect. Beneficial – active intervention is undertaken to preserve the site. For purposes of §106, the determination of effect would be no adverse effect.

Alternative A – No Action
Direct/Indirect Impacts: The No-Action Alternative would have no direct effect on identified cultural resources, with one exception; the continued presence of the Monument toilet in an identified archeological site would have a direct adverse impact to the site. If no action were taken, this toilet would remain in its current location and would continue to impact the site. Because all existing corridor and backcountry toilets would remain in their current condition and function, and no toilets would be moved, added or changed, no impacts to cultural landscapes would result. All of the backcountry toilet sites have an existing toilet. Each of these areas was surveyed for archeological evidence before the existing toilets were installed. Continued maintenance of backcountry and corridor toilets under the existing program would result in minor long-term adverse impacts to cultural resources through continued use of historic trails to access toilets for cyclic and/or periodic maintenance and the continued presence of a toilet at the Monument site.

Effects Common to All Alternatives
Direct/Indirect Effects. All toilet sites have been surveyed for archeological resources and measures to avoid impacts to these resources have been incorporated into the proposed actions. All of the backcountry toilet sites have an existing toilet. Each of these areas was surveyed for archeological evidence before the existing toilets were installed. The proposed location for the Waldron Basin toilet site (Figure 4) has been surveyed and no archeological resources occur at the proposed location. The relocation of the Monument toilet from its current location in an archeological site to that proposed (Figure 3) where archeological resources do not occur (Alternatives B and C) is expected to alleviate on-going adverse impacts to this site. The Horseshoe Mesa toilets are near, but outside of, the Grandview Mine historic district boundary. The replacement of the existing pit toilet at the group site with an above ground vault would not impact the district due to the distance form the historic district boundary and the fact that the toilet is not visible from the district. There would be no change in the location or use of the toilets along the corridor and therefore impacts to the Cross-Canyon Corridor Historic District or the Trans-Canyon Telephone Line Historic District would not occur. Cyclic maintenance methods and periodic empty/removal methods, whether by helicopter or mule would not impact the historic districts in these areas, the historic nature of the corridor trails or change in any measurable way the significance of the cultural landscapes in these areas.

Cumulative Impacts: The historic districts and the overall cultural landscape of the inner canyon have sustained previous impacts as the result of modifications to some historic buildings, trails and structures. Modern buildings and man-made features have also intruded on the historic setting of the cultural landscape. Furthermore, previous deterioration of some trails and buildings as a result of natural weathering and use has compromised defining architectural characteristics. Past development of Park facilities has likely impacted archaeological resources in the area. Loss or disturbance of archaeological sites in the inner canyon (in conjunction with previous losses and prevailing threats to finite numbers of archaeological resources throughout the region) incrementally diminishes the overall understanding of Grand Canyon's cultural history. These

past impacts are moderate, adverse, local, and long-term. Most of the foreseeable future projects that have the potential to affect cultural resources have been previously discussed with SHPO. Continued consultation with SHPO and application to the Secretary's Standards as the basis for future project planning would ensure that the potential for adverse effects to cultural resources would be minimized. Therefore, adverse cumulative effects would be moderate, local, and long-term. Minor to moderate beneficial cumulative impacts to individual historic resources would also result from implementing planned projects designed to rehabilitate or protect historic structures, such as the rehabilitation of Indian Garden Ranger Station and the many trail rehabilitation projects that are planned.

Impairment: Adverse impacts under any of the alternatives would be minor to moderate. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Grand Canyon National Park; (2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or (3) identified as a goal in the Park's general management plan or other relevant NPS planning documents, there would be no impairment of the Park's cultural resources or values.

Alternative B – Preferred Alternative

Direct/Indirect Effects. The use of helicopters to install and periodically maintain many of the backcountry toilets would not routinely result in ground disturbance. Helicopters would hover over the site to drop off the vault toilet or pick up a full unit, with a hover time of less than a few minutes. In only rare situations would a helicopter land near a toilet site during installation or periodic maintenance, hover over the site while the ground crew released it. Although variations may occur due to differences in terrain and access at each site, this would require a helicopter to hover over the site for approximately 2-3 minutes before returning to the South Rim. The helicopter would only land in the rare event that no NPS personnel are not present on the ground to perform helicopter duties. In this instance, the landing site would be an area already disturbed and would not likely result in disturbance of cultural resources.

The use of mules to periodically maintain some of the corridor toilets and backcountry toilets has the potential to impact cultural resources. While mule access to toilet locations would be via existing trails where existing facilities exist for hitching, etc. there is the potential for mules to veer off trail occasionally or to disturb ground adjacent to trails, the toilet location or hitching areas. This ground disturbance has the potential to impact archeological resources or historic trail resources, but this impact is expected to be occasional and minor.

Alternative C - Backpacking

Direct/Indirect Effects. The use of backpacking to periodically maintain backcountry toilets has the potential to impact cultural resources. While hiking access to toilet locations would be via existing trails, there is the potential for hikers to veer off trail occasionally or to disturb ground adjacent to trails or adjacent to the toilet location. While park personnel would follow all NPS policy and procedures during maintenance work and would adhere to a "leave no trace" policy, with the large numbers of personnel that would be required to transport waste via backpack along backcountry trails under Alternative C, impacts to cultural resources are possible. However, ground disturbance near trails and toilet sites when backpacking waste out of the canyon would be uncommon and impacts to cultural resources would be occasional and minor.

Conclusion: The No-Action Alternative would have minor, adverse, long-term, effects to archeological resources and the historic cultural landscape. Of the action alternatives, the

preferred alternative would have the least potential for adverse impacts to cultural resources, since ground disturbance during periodic emptying/removal would be minimized with the use of helicopters. The use of mules and backpacking to periodically maintain toilets would result in minor long-term impacts to archeological resources and the historic cultural landscape. Adverse cumulative effects would be moderate, local, and long-term. Adherence to mitigation measures for cultural resources would help insure that the potential for adverse impacts would be minimized.

After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, Assessment of Adverse Effects), the National Park Service concludes that implementation of Alternative B or Alternative C would result in a "no historic properties affected" determination.

Chapter 4 – List of Preparers

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Chapter 5 – Consultation with Others

Meeting with US Fish and Wildlife Service and Arizona Game and Fish Department in Flagstaff, AZ on December 13, 2000

Public Scoping Letter for Park-wide Restroom Rehabilitation sent to a mailing list of over 300 people on December 8, 2000, including U. S. Fish and Wildlife Service, State Historic Preservation Office, and nine affiliated tribes.

Public Scoping Letter for Backcountry Toilets sent to a mailing list of over 300 people, including U. S. Fish and Wildlife Service, State Historic Preservation Office, and nine affiliated tribes.

Public Scoping Letter for Backcountry Toilets sent to a backcountry users mailing list of 150 people on October 24, 2001.

Public Scoping Letter put on Grand Canyon National Park website and Grand Canyon trail users newsgroup on October 25, 2001.

Comments in response to the Backcountry Toilets scoping letter were received from the following:

19 responses from individuals (15 positive; 1 negative; 3 neutral)

Responses were received from the following agencies/groups:

- Arizona Wilderness Coalition
- U.S. Fish and Wildlife Service
- Arizona Department of Environmental Quality
- Zuni Heritage and Historic Preservation Office
- The Hopi Tribe
- Navajo Nation

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DO-12 Conservation Planning, Environmental Impact Analysis and Decision Making

DO-28 Cultural Resource Management

DO-41 Wilderness Preservation and Management

DO-65 Explosives Use and Blasting Safety

NPS-77 Natural Resources Management Guideline

DO-77-1 Wetland Protection

DO-13 Environmental Leadership (DRAFT)

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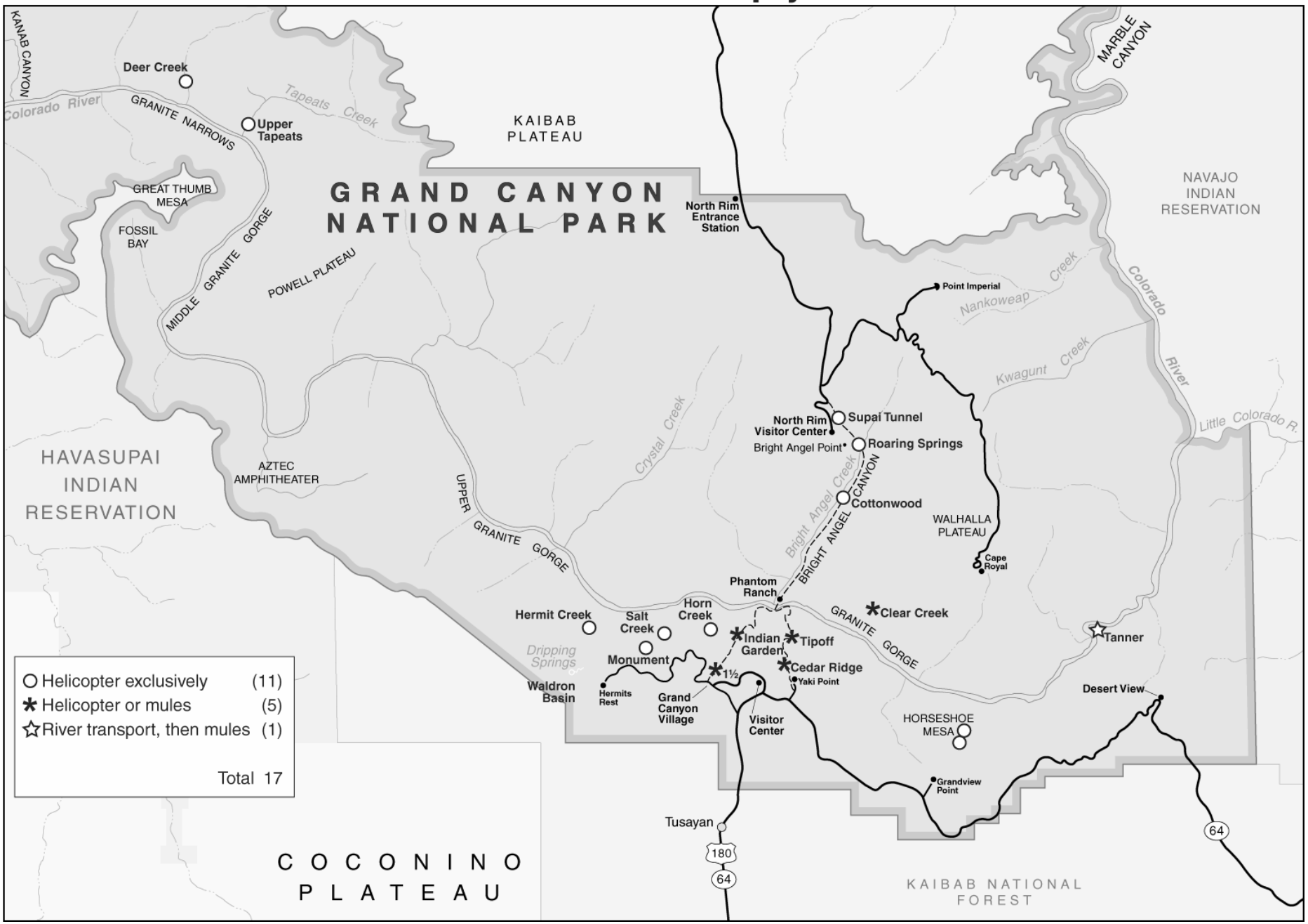
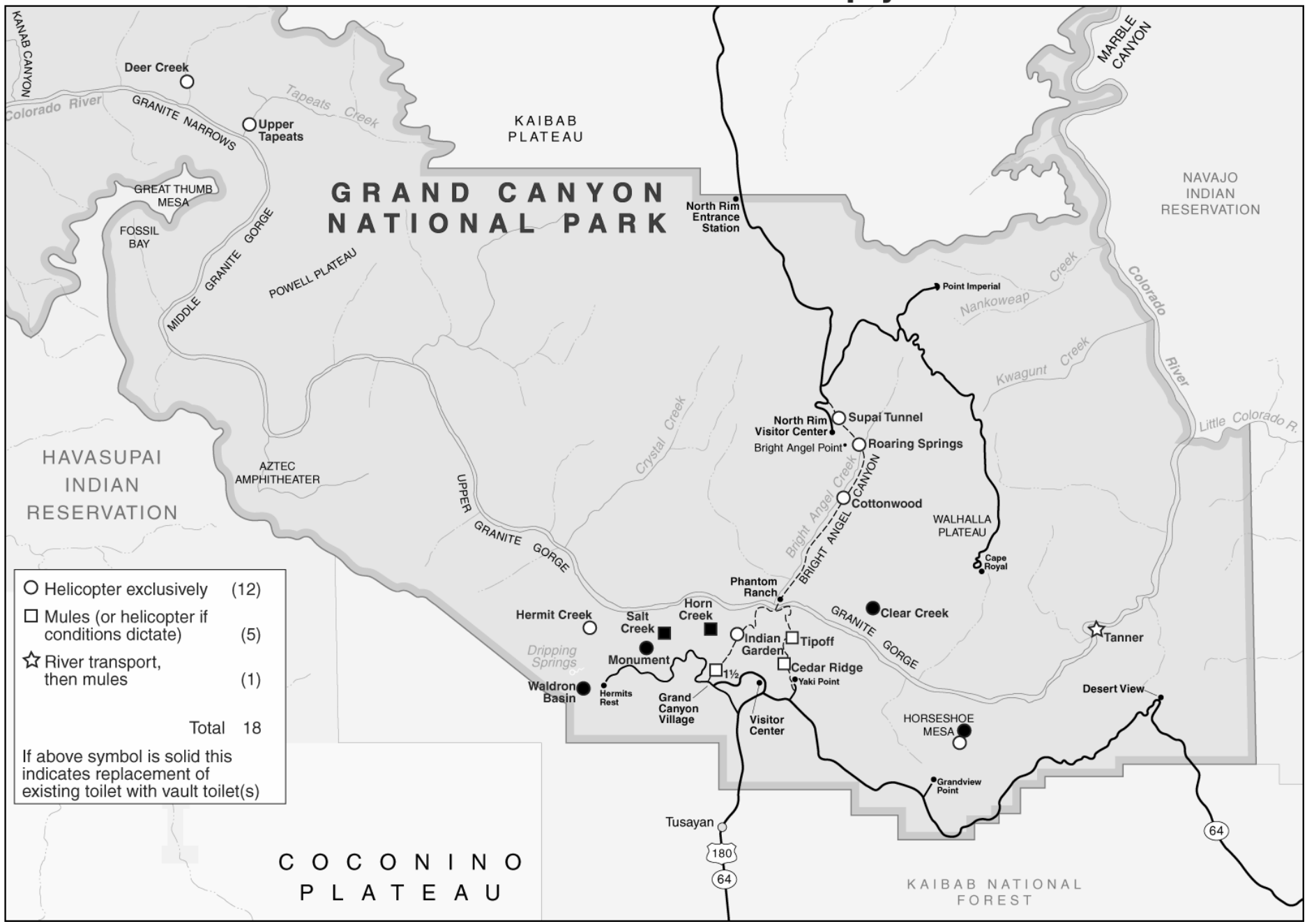
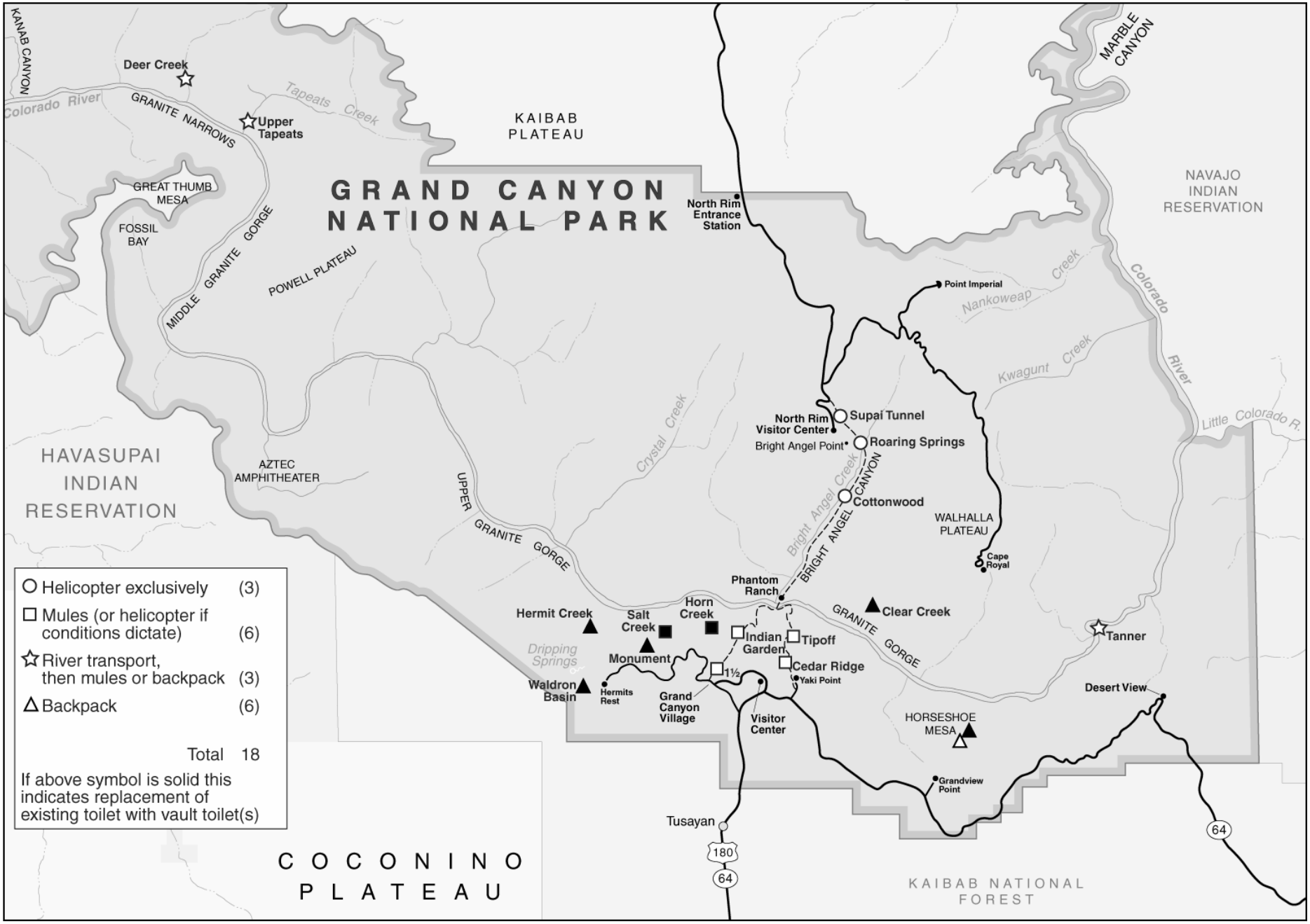
Alternative A - No Action for Empty/Removal Method



Alternative B - Preferred Alternative for Empty/Removal Method



Alternative C - Minimal Helicopter Use for Empty/Removal Method



APPENDIX B

Excerpts Pertaining to Replacement/Rehabilitation and Maintenance of Backcountry and Corridor Toilets Project

Vision Statement for Undeveloped Areas

Over 90% of the Park is proposed for wilderness. These areas offer visitors opportunities for solitude and primitive recreation. The management of these areas should preserve the wilderness values and character. Nonwilderness undeveloped areas should continue to serve primarily as primitive thresholds to wilderness.

Visitors traveling through the canyon on the Colorado River should have the opportunity for a variety of personal outdoor experiences, ranging from solitary to social. Visitors should be able to continue to experience the river corridor with as little influence from the modern world as possible. The river experience should help visitors to intimately relate to the majesty of the canyon.

Management Objectives (Page 7 – 8)

The management objectives for Grand Canyon National Park, which are based on the Park visions, set the direction for future Park management. The objectives describe desired conditions to be achieved.

International Significance

- Manage the Park to preserve its integrity as a world heritage site with natural and cultural resources of national and international significance.

Natural And Cultural Resources

- Preserve, protect, and interpret the Park's natural and scenic resources and values, and its ecological processes.
- Preserve, manage, and interpret Park cultural resources (archeological, ethnographic, architectural, and historic resources, trails, and cultural landscapes) for the benefit of present and future generations.
- Preserve, protect, and improve air quality and related values such as visibility.
- Manage visitor use, development, and support services to protect the Park's resources and values.
- Preserve and protect the genetic integrity and species composition within the Park, consistent with natural ecosystem processes.
- To the maximum extent possible, restore altered ecosystems to their natural conditions. In managing naturalized ecosystems, ensure the preservation of native components through the active management of nonnative components and processes.
- Manage ecosystems to preserve critical processes and linkages that ensure the preservation of rare, endemic, and specially protected (threatened/endangered) plant and animal species.

- Protect the natural quiet and solitude of the Park, and mitigate or eliminate the effects of activities causing excessive or unnecessary noise in, over, or adjacent to the Park.
- Preserve natural spring and stream flows and water quality. Withdraw only the minimum water necessary to meet Park purposes. To the maximum extent feasible, strive to meet increases in water demand by conserving and reusing water.
- Provide opportunities for scientific study and research focused on the Grand Canyon, consistent with resource protection and Park purposes.
- Inventory, monitor, and maintain data on Park natural and cultural resources and values, and utilize this information in the most effective ways possible to facilitate Park management decisions to better preserve the Park.
- Clearly delineate and maintain the Park boundary to protect Park resources and values.
- Identify and evaluate all cultural properties within the Park for inclusion on the National Register of Historic Places.
- Collect ethnographic data and develop ethnohistories for the Havasupai, Hopi, Hualapai, Navajo, Southern Paiute, and Zuni peoples concerning their associations with the Grand Canyon, as appropriate, in order to preserve, protect, and interpret Park resources and values important to diverse American Indian cultures, including significant, sacred, and traditional use areas.

Wilderness And Wild River Management

- Manage areas meeting the criteria for wilderness designation as wilderness. Actively pursue the designation of these lands as part of the national wilderness preservation system.
- Manage the Colorado River corridor through Grand Canyon National Park to protect and preserve the resource in a wild and primitive condition. Actively pursue the designation of eligible segments of the Colorado River and its tributaries as part of the national wild and scenic rivers system.

Visitor Experience

- Provide a diverse range of quality visitor experiences, as appropriate, based on the resources and values of the Grand Canyon, compatible with the protection of those resources and values.
- Provide access that is appropriate and consistent with the character and nature of each landscape unit and the desired visitor experience.
- Consistent with Park purposes and the characteristics of each landscape unit, preserve and protect the maximum opportunities in every landscape unit of the Park for visitors to experience the solitude, natural conditions, primitiveness, remoteness, and inspirational value of the Grand Canyon.
- Provide equal access to programs, activities, experiences, and recreational opportunities for individuals with disabilities, as appropriate and consistent with the levels of development and inherent levels of access in areas within the Park.
- Provide a wide range of interpretive opportunities and information services to best assist, inform, educate, and challenge visitors.
- Educate and influence the public through positive action to preserve and protect the world they live in, including but not limited to the Park.
- Provide a safe, efficient, and environmentally sensitive transportation system for visitors, employees, and residents, consistent with management zoning and resource considerations. Emphasize nonmotorized modes of transportation wherever feasible.
- Develop visitor use management strategies to enhance the visitor experience while minimizing crowding, conflicts, and resource impacts.

- Provide visitor and employee facilities and services, as necessary and appropriate, in or adjacent to areas dedicated to those uses or in appropriate disturbed areas.

Facility Design

- Consistent with its purpose, strive to make Grand Canyon National Park a model of excellence in sustainable design and management through such means as energy efficiency, conservation, compatibility with historic setting and architecture, recycling, accessibility, and the use of alternative energy sources.
- Encourage appropriate use and adaptive reuse of historic structures, while preserving historic integrity.
- Ensure that development and facilities within the Park are necessary for Park purposes.
- Design high-quality facilities that exemplify visual consistency and appropriateness.
- Ensure that Park developments and operations do not adversely affect Park resources and environments, except where absolutely necessary to provide reasonable visitor access and experiences.

Undeveloped Area Management Objectives (Page 10)

Undeveloped areas are considered to be all areas within the Park boundaries not within the areas described for the South Rim, North Rim, Tuweep, or corridor trails. The following objectives are in addition to the overall Park objectives.

- Manage and monitor visitor use and Park resources in the Park's undeveloped areas to preserve and protect natural and cultural resources and ecosystem processes, and to preserve and maintain a wilderness experience or, where an area is not proposed for wilderness, a primitive experience.
- Establish indicators and standards for desired visitor experiences and resource conditions, monitor the condition of those indicators on a regular basis, and take action to meet the standards if they are not being met.
- Provide a variety of primitive recreational opportunities consistent with wilderness and NPS policies on accessibility. In deciding which opportunities would be provided in the undeveloped areas of the Park, consider recreational opportunities available outside the Park, as well as opportunities available in developed areas of the Park.
- Conduct administrative activities, including research, search-and-rescue, emergencies, and fire management, in a manner that is consistent with NPS policies regarding wilderness management and the use of the minimum tool in wilderness areas.
- Maintain roads designated open to public or administrative motor vehicle use in undeveloped areas in an unpaved condition without major improvements. Only consider improvements that reduce resource impacts in keeping the road minimally open for vehicle use. Revegetate all roads not designated for vehicle use, or convert them to trails as appropriate.
- Consistent with the above goals, reduce conflicts among undeveloped area users, including river, hiker, stock, motorized and nonmotorized users.
- Provide a wilderness river experience on the Colorado River (this objective will not affect decisions regarding the use of motorboats on the river).

Interrelationship of this Plan with other Plans and Projects

Plans and studies used to develop this document are listed in the bibliography. The plans listed below directly influenced the development of the *General Management Plan*. Separate action plans that will need to be prepared to implement this plan are also identified.

Wilderness

A wilderness proposal was prepared in 1980 at the request of Congress; it was updated in 1993 and awaits further action. Wilderness designation was proposed for 1,109,257 acres, with an additional 29,820 acres of potential wilderness, pending the resolution of Park boundary and motorized riverboat issues.

NPS *Management Policies* (1988) require that wilderness study areas be managed the same as designated wilderness and that no actions be taken that would diminish wilderness suitability until the legislative process for wilderness designation has been completed.

Therefore, this *General Management Plan* treats all proposed wilderness areas as wilderness and anticipates the final resolution of wilderness issues and the preparation of a wilderness management plan as future actions. All actions proposed in this document, and all future implementation plans based on it (such as the *Backcountry Management Plan*, the *Colorado River Management Plan*, and the *Fire Management Plan*) will be consistent with NPS wilderness policy requirements.

Backcountry Management

The Park's 1988 *Backcountry Management Plan* will be updated to be consistent with the direction provided in the management objectives and other sections of this plan. A wilderness experience will be provided in all proposed wilderness areas. Ways to manage use in backcountry areas, including the corridor trails and Tuweep, will generally be addressed in the revised plan according to the direction provided in this *General Management Plan*, including the possibility of day use permits or other restrictions in certain areas.

APPENDIX C

Compliance

The following laws and associated regulations provided direction for the design of project alternatives, the analysis of impacts, and the formulation of mitigation/avoidance measures:

National Environmental Policy Act of 1969 (NEPA) (Title 42 U.S. Code Sections 4321 to 4370 [42 USC 4321-4370]). The purposes of NEPA include encouraging "harmony between [humans] and their environment and promote efforts which will prevent or eliminate damage to the environment. . .and stimulate the health and welfare of [humanity]". The purposes of NEPA are accomplished by evaluating the effects of federal actions. The results of these evaluations are presented to the public, federal agencies, and public officials in document format (e.g., environmental assessments and environmental impact statements) for consideration prior to taking official action or making official decisions. Implementing regulations for the NEPA are contained in Part 1500 to 1515 of Title 40 of the U.S. Code of Federal Regulations (40 CFR 1500-1515).

Clean Water Act of 1972, as amended (CWA) (33 USC 1251-1387). The purposes of the CWA are to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters". To enact this goal, the U.S. Army Corps of Engineers (Corps) has been charged with evaluating federal actions that result in potential degradation of waters of the U.S. and issuing permits for actions consistent with the CWA. The U.S. Environmental Protection Agency also has responsibility for oversight and review of permits and actions, which affect waters of the U.S. Implementing regulations describing the Corps' CWA program are contained in 33 CFR 320-330.

Clean Air Act (PL chapter 360, 69 Stat 322, 42 USC 7401 et seq.). The main purpose of this act is to protect and enhance the nation's air quality to promote the public health and welfare. The act establishes specific programs that provide special protection for air resources and air quality related values associated with NPS units. The U.S. Environmental Protection Agency has been charged with implementing this Act.

Endangered Species Act of 1973, as amended (ESA) (16 USC 1531-1544). The purposes of the ESA include providing "a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved". According to the ESA, "all Federal departments and agencies shall seek to conserve endangered species and threatened species" and "[e]ach Federal agency shall. . .insure that any action authorized, funded, or carried out by such agency. . .is not likely to jeopardize the continued existence of any endangered species or threatened species". The U.S. Fish and Wildlife Service (non-marine species) and the National Marine Fisheries Service (marine species, including anadromous fish and marine mammals) administer the ESA. The effects of any agency action that may affect endangered, threatened, or proposed species must be evaluated in consultation with either the USFWS or NMFS, as appropriate. Implementing regulations which describe procedures for interagency cooperation to determine the effects of actions on endangered, threatened, or proposed species are contained in 50 CFR 402.

National Historic Preservation Act of 1966, as amended (NHPA) (16 USC 470 *et sequentia*). Congressional policy set forth in the NHPA includes preserving "the historical and cultural foundations of the Nation" and preserving irreplaceable examples important to our national heritage to maintain "cultural, educational, aesthetic, inspirational, economic, and energy benefits". The NHPA also established the National Register of Historic Places composed of "districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture". The NHPA requires that federal agencies take into account the effects of their actions on properties eligible for or included in the National Register of Historic Places and coordinate such actions with State Historic Preservation Offices (SHPO). NHPA also requires federal agencies, in consultation with the SHPO, to locate, inventory, and nominate all properties that appear to qualify for the National Register of Historic Places, including National Historic Landmarks. Further, it requires federal agencies to document those properties in the case of an adverse effect and propose alternatives to those actions, in accordance with the NEPA.

APPENDIX D

Minimum Requirement Analysis Worksheet

Rehabilitation, Replacement and Maintenance of
Backcountry and Corridor Toilets

Grand Canyon National Park

PROPOSED ACTION
Replacement, Rehabilitation and Maintenance of Backcountry and Corridor Toilets

PART A: MINIMUM REQUIREMENT: Is this action necessary to manage the area as wilderness?

1. **IS THIS AN EMERGENCY?**

   → YES: Act according to approved emergency minimum tool criteria.

   → NO: **XX**

2. **IS THE PROPOSED ACTION ALLOWED BY LEGISLATION, POLICY, OR AN APPROVED MANAGEMENT PLAN?**

   → YES: Do according to approved criteria.

   → NO: **XX**

3. **CAN THE OBJECTIVES BE ACCOMPLISHED THROUGH AN ACTION OUTSIDE OF WILDERNESS?**

   → YES: Do it there.

   → NO: **XX**

4. **DOES THIS ACTION CONFLICT WITH LONG-TERM WILDERNESS PLANNING GOALS, OBJECTIVES OR DESIRED FUTURE RESOURCE CONDITIONS?**

   → YES: Do not do action.

   → NO: **XX**

5. CAN THE OBJECTIVES BE ACCOMPLISHED THROUGH AN ACTION THAT DOES NOT INVOLVE PROHIBITED USES?

→ YES, Do it without actions or tools generally defined by the law and policy.

→ NO: **XX** → **DO PART B**

As defined by law and policy, the use of motorized vehicles is generally prohibited "except as necessary" to meet the minimum requirement for the purpose of the administration of the area as wilderness. Managers must consider the impacts to the aesthetics and traditions of wilderness as well as the costs and efficiency of the equipment/transportation.

If you answered YES to all the above questions with references in Question 2, attach this to a Project Prosposal, Permit, Action Plan, or appropriate document.

PART A reviewed by: _____

Date:_____

PART B: Determining the MINIMUM TOOL (*HOW the action should be done)*

6. DESCRIBE IN DETAIL, ALTERNATIVE WAYS TO ACCOMPLISH THE PROPOSED ACTION. (This may include primitive skills/tool, mechanized/motorized, and/or combination of alternatives.)

Guiding questions to answer for each alternative:

What is proposed?

Where will the action take place? (location)

When will the action take place? (dates/use periods)

How often will this activity take place? (frequency)

How long will it take to complete the activity? (duration)

What design and standards will apply?

What methods and techniques will be used? (tools, etc.)

How many people are needed to complete the action?

Why is it being proposed in this manner?

If there are adverse impacts, how long will they persist?

What mitigation will take place to minimize impacts?

CRITERIA TO EVALUATE ALTERNATIVES:

Biophysical effects (magnitude, duration, and frequency)

Social/Recreational/Experiential effects

Societal/Political effects

Health/Safety concerns

Economical and Timing considerations

ALTERNATIVE A - No Action – Continuation of current program as described in detail on pages 18-20 of the attached EA. This includes helicopter flights (up to an estimated 62 flights/year) for periodic empty/removal of 8 out of 10 backcountry sites, and helicopter flights (up to an estimated 57 flights/year) for periodic empty/removal of all 7 corridor sites. Mules are occasionally used for some of these sites, but helicopters have been used more commonly in recent years. This alternative does not include replacement of any existing pit toilets or outhouses. Mitigation measures that would apply to this alternative are included on pages 29-31 of the attached EA. A summary of the expected effects of implementation of this alternative on visitor experience, park operations, species of concern and soundscape are summarized on pages 37-39 of the attached EA.

ALTERNATIVE B - Preferred Alternative – Replacement of existing pit toilets and outhouses with aboveground vaults; helicopter use for installation of new aboveground vaults; helicopter flights (up to 24 flights/year) for periodic empty/removal of 7 out of 11 backcountry toilet sites and helicopter flights (up to 38 flights/year) for 4 out of 7 corridor toilet sites. The remaining sites would be periodically emptied through the use of mule trips or river transport. This alternative is described in detail on pages 25-28 of the attached EA. Mitigation measures that would apply to this alternative are included on pages 29-31 of the attached EA. A summary of the expected effects of implementation of this alternative on visitor experience, park operations, species of concern and soundscape are summarized on pages 37-39 of the attached EA.

ALTERNATIVE C – Backpacking - Replacement of existing pit toilets and outhouses with aboveground vaults; helicopter use for installation of new aboveground vaults; helicopter flights (up to 22 flights) for periodic empty/removal of 3 out of the 7 corridor toilet sites. All backcountry and the remaining corridor sites would be periodically emptied through the use of mule trips, river transport, or backpacking. This alternative is described in detail on pages 25-28 of the attached EA. Mitigation measures that would apply to this alternative are included on pages 29-

31 of the attached EA. A summary of the expected effects of implementation of this alternative on visitor experience, park operations, species of concern and soundscape are summarized on pages 37-39 of the attached EA.

7. EVALUATE WHICH ALTERNATIVE WOULD HAVE THE LEAST IMPACT ON WILDERNESS RESOURCES, CHARACTER AND VISITOR EXPERIENCE WHILE ACHIEVING THE OBJECTIVES.

Alternative C would have the least impact on wilderness resources, character and visitor experience because it proposes the fewest number of helicopter flights and proposes non-mechanized methods of periodic toilet maintenance at more sites than either Alternatives A or B. However, Alternative C includes the use of backpacks for all backcountry sites. This would entail transferring human waste from toilets into transportable containers and then carrying this waste out of the inner canyon (or to the river as applicable) via a backpack. As described in Chapter 3 of the attached EA, this method, while feasible and not in violation of any NPS or Park policy, would be highly labor intensive and would expose Park employees to health and safety risks. Due to the sheer volume of waste at some sites and the remoteness of many of the backcountry toilet locations, it would require many people multiple days to empty any one toilet. As shown in Table 8 on page 49 of the attached EA, it would require an estimated 26 backpack loads per aboveground vault to empty it, with those 26 people hiking up to xx miles one way. This would be extremely difficult and costly.

For these reasons, Alternative B is considered the alternative that best meets the purpose and need for action and addresses all project objectives, while also reducing the volume and frequency of administrative helicopter use in the backcountry over current levels. Alternative B would result in the reduction in the number of helicopter flights necessary for toilet maintenance from 62 flights/year to 24 flights/year in the backcountry (a 61% reduction) and from 57 flights to 38 flights/year in the corridor (a 33% reduction). Alternative B proposes the use of mules when trail standards and conditions warrant and helicopter use when toilet sites are not accessible by mule or river trip. Alternative B does not propose backpack transport of human waste due to the high labor-intensiveness of this method and the health and safety risks it poses for employees.

8. SELECT AN APPROPRIATE PREFERRED ALTERNATIVE.

Alternative B is the preferred alternative, based on the reasons described above and as fully described and evaluated in the attached EA.

APPENDIX E

Foreseeable Future Actions

Below are brief descriptions of foreseeable future actions in the inner canyon that were considered during the cumulative impact analysis.

Routine Backcountry Management Activities under the 1988 Backcountry Management Plan – Routine activities that have been on-going in the backcountry since the finalization of the 1988 Backcountry Management Plan, and are expected to continue into the foreseeable future, include such things as the implementation of inner canyon campsite monitoring, trailside monitoring and rehabilitation of social trailing at many backcountry sites.

Corridor Fire Protection System Upgrades - This project would install detection and alarm systems, automated sprinkler systems, and an enhanced and expanded standpipe hydrant network with associated equipment at several of the most vulnerable structures in the corridor. It would also upgrade the existing water system to enable it to deliver the volume and pressure needed to supply these systems. The standpipe network upgrade would install new hydrants capable of the required regulatory flow at key location with necessary hose boxes, fire hose, nozzles, and other required equipment. These upgrades would occur at Indian Garden, Phantom Ranch, Cottonwood Camp and Roaring Spring. Equipment needed for this project would include a gasoline-powered trencher and a small excavator (Bobcat-size). The equipment would be flown in and out by helicopter to Indian Garden and Phantom Ranch. Work at Cottonwood Camp and Roaring Spring would require only hand tools that would be packed into the sites by work crews.

Grandview East Trail Maintenance - This project is a sub-set of a larger Park-wide trail maintenance and rehab effort. Phase 1 of the Grandview East project will be focused on the 1.05 mile Page/Miner's Spring trail. The Page/Miner's Spring trail is a Type C (wilderness), Level IV trail that lies within the Horseshoe Mesa Use Area (Threshold Management Zone). Work will be completed in accordance with the Proposed Trail Standards in the 1988 Backcountry Management Plan. The primary focus will be to stabilize, rehabilitate or replace in kind historic features and in their absence delineate the trail to reduce impacts on natural and cultural resources. The Page/Miner's Spring trail is designated in the BMP as a threshold trail, being a constructed trail with significant historic features. Trail maintenance will be preformed on previously constructed sections to protect the integrity of historic features including retaining walls, riprap, log cribbing, and erosion control devices. Erosion control features (rock or log checks, rock retaining walls, and water bars) will be added where necessary to correct trail erosion. Additional phases of work on other sections of the Grandview East Trail would also be conducted following cultural resources inventory and evaluations. A Minimum Requirement Analysis has been conducted for this proposed work and includes provisions to schedule necessary helicopter flights to coincide with other administrative use flights.

North Kaibab Routine Trail Maintenance - This project is a sub-set of a larger Park-wide trail maintenance and rehab effort. The General Management Plan states that the North Kaibab trail should be maintained to accommodate high levels of visitor use. The trail is 14 miles long, beginning at the North Rim and ending just short of the Colorado River. Consistent yearly efforts are required to maintain an easily passable trail tread on the North Kaibab trail. The transcanyon

pipeline runs beneath portions of the trail and must be protected. This project proposal will describe intended work on the trail for a five-year period from April 2002 through April 2007. The vast majority of all trail work completed on the North Kaibab trail falls into one of two categories. The first is non-structural cyclic maintenance. This type of work involves cleaning drainage devices (water bars and ditches), minimal replacement of liner rocks, minimal replacement of log and stone check dams, and minor repair of retaining walls. The second category is structural cyclic maintenance. This is a slower moving, more extensive level of cyclic maintenance. It takes place when most of the erosion control devices and material retention devices are missing or in a degraded, non-functional condition. At this level the trail tread has become difficult to negotiate. To bring the trail back to an easily maintainable and safe condition, all devices in a given stretch must be systematically repaired or replaced and new tread material hauled in. All trail rehabilitation work will be completed using historically compatible building techniques. Liners will be built with stone. Check dams and waterbars will be built with stone when available or with logs in the absence of stone.

Work that does not fall into the above categories is generally required when a flood has occurred or when heavy snowfall leads to extensive Spring runoff. Flood damage can range from small deposits of overburden to destruction of large sections of trail. This type of damage must be addressed on an incident by incident basis. Damage incurred by Spring runoff is normally repaired in the month prior to the opening of the North Rim. This work is focused on the five miles from the trailhead to Roaring Springs, where most damage occurs. This work can include rebuilding of large sections of trail, particularly in the Supai section. Retaining walls are often lost to runoff damage and must be repaired or replaced. Where walls are completely lost they will be rebuilt to the best current standards. Where portions of historic fabric remain, repair work will be built to match original construction.

The majority of the work will be accomplished using handtools, pionjars (gas-powered rock drill / hammer), and chainsaws. Chainsaw use will occur when trimming of logs is necessary and will be minimal. The pionjar will be used to split rock, drill holes, shape rock, and loosen compacted material. Jackhammers were used in the original construction of the trail and have been used for maintenance throughout the trail's history. Helicopter transport of materials will occasionally be necessary when demand exceeds the supply capabilities of the mule packer. Helicopter use will be minimal. Floods or runoff may cause rock fall that is too large to remove by routine maintenance efforts. On these occasions the use of explosives or "boulder blaster" will be necessary. Approval for these actions will be obtained on an incident by incident basis.

Bright Angel Routine Trail Maintenance This project is a sub-set of a larger Park-wide trail maintenance and rehab effort. The General Management Plan states that the Bright Angel Trail should be maintained to accommodate high levels of visitor use. The Bright Angel Trail is 7 miles long, beginning at the South Rim and ending at the Colorado River. This proposal will also include the 1.5-mile Plateau Point trail and the 2-mile River trail. Consistent yearly efforts are required to maintain an easily passable trail tread on the Bright Angel, Plateau Point, and River trails. The Transcanyon Pipeline runs beneath portions of these trails and must be covered with fill for protection. This project proposal will describe intended work on these trails for a five-year period from April 2002 through April 2007.

The vast majority of all trail work completed on the Bright Angel, Plateau Point, and River Trails fall into one of two categories, as described above for the North Kaibab Trail; non-structural cyclic maintenance and structural cyclic maintenance. Work that does not fall into the above categories is generally required when a flood has occurred. Work necessary following flood damage on the Bright Angel is as described above for the North Kaibab Trail. Tool use is also as described above,

including handtools, pionjars, and jackhammers. Helicopter transport of materials will occasionally be necessary when demand exceeds the supply capabilities of the mule packer. Helicopter use will be minimal. Floods or runoff may cause rock fall that is too large to remove by routine maintenance efforts. On these occasions the use of explosives or "boulder blaster" will be necessary. Approval for these actions will be obtained on an incident by incident basis.

Three Mile Composting Toilet Installation - This project would construct a three-stall composting toilet at Three Mile House along the Bright Angel Trail in the inner canyon. The site selected for the new toilet is a disturbed site, void of trees and shrubs, so construction of the new toilet would not require substantial disturbance of existing vegetation. Blasting or rock excavation would not be permitted for this project.

Indian Garden Ranger Station Rehabilitation – This building is listed on the National Register of Historic Places. This project would rehabilitate this historic 600 square foot building which is in need of repair to prevent further structural deterioration to floors, foundation and roof. A cultural landscape inventory is currently underway to help guide the project and aide in determining the best use of the building. Indian Garden is the most popular day-use destination in the inner canyon and serves approximately 75,000 visitors per year. Rotted structural components would be replaced and electrical and sewer systems would be upgraded. Project components may also include the addition of visitor information exhibits, safety displays and interpretive materials. Site improvements may include walkway repair and installation and the addition of picnic tables and benches.

Indian Garden Restroom Rehabilitation - This project would rehabilitate the existing composting toilets at Indian Garden. Work would include replacing interior partitions and plumbing fixtures, replacing or repairing doors and windows, improving ventilation, repairing or replacing the roof, and exterior painting and finish repair, as needed. The project would not result in ground or vegetation disturbance. The project is not in riparian habitat and is not expected to result in any off-site impacts.

Phantom Ranch Ranger Station Rehabilitation - This project would include a full rehabilitation of the ranger station. Interior work would include such things as asbestos removal, removal of interior partitions, pest exclusion, replacement of plumbing, mechanical and electrical systems, installation of a sprinkler system, new flooring and interior finishes and new windows and doors. Exterior work would be limited to siding repair, roof repair, and some minor site work such as walkway repair. Only minimal maintenance to this building has been performed since its construction in 1961, due to its remote location. Although the building itself is not eligible for listing on the National Register of Historic Places, it is near the Phantom Ranch Historic District and the potential for impacts to this nearby district would be carefully evaluated during project planning. This project would significantly improve the quality of visitor services in this remote location (medical and visitor contact), and improve the health and safety of personnel assigned to this remote location. This area receives over 30,000 visitors per year.

Phantom Ranch Restroom Rehabilitation - This project would rehabilitate the existing restroom near Phantom Ranch, located near the Bright Angel Creek confluence with the Colorado River. Work would include installing low-flow plumbing fixtures, replacing or repairing doors and windows, improving ventilation and repairing or replacing the roof. The project would not result in ground or vegetation disturbance. The project is not in riparian habitat and is not expected to result in any off-site impacts.

Bright Angel Restroom Rehabilitation - This project would rehabilitate the existing restroom near Phantom Ranch, located within Bright Angel campground along Bright Angel Creek. Work would

include replacing interior partitions and installing low-flow plumbing fixtures, replacing or repairing doors and windows, improving ventilation, repairing or replacing the roof, and exterior painting and finish repair, as needed. The project would not result in ground or vegetation. The project is not in riparian habitat and is not expected to result in any off-site impacts.

Rehabilitation of Black and Silver Bridges - This project involves rehabilitation on both bridges in the inner canyon, for improving their structural integrity. Work required for the silver bridge is relatively minor and includes resetting anchor points and removing debris from the site. The black bridge requires more extensive work including such things as tightening longitudinal wires, replacing portions of the deck, replacing the conveyor belt, tightening the bridge, and painting. All aspects of the work are currently being evaluated and prioritized.

Revision of the 1988 Backcountry Management Plan – As stated in a court settlement agreement (February 5, 2002 Grand Canyon Private Boaters Ass'n v. Alston, Case No. CV-00-1277-PCT-PGR-TSZ) NPS has agreed to publish a Notice of Intent to review and revise the Park's Backcountry Management Plan, separate from the preparation of the Colorado River Management Plan, by the end of 2005. NPS expects this planning process and environmental documentation to take approximately 2-3 years to complete, at a minimum. Existing management activities in the backcountry and those proposed in this document would be reviewed and revised as appropriate during this planning process.